

TH

INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY 2022

RECOVER TOGETHER,
RECOVER STRONGER & SMARTER
**SMARTIZATION, GOVERNANCE
& COLLABORATION**

PROCEEDING

ISBN : 978-1-6654-7135-0

**10TH - 11TH
AUGUST 2022**

Supported by:



General Chair

- Prof. Suhono Harso Supangkat (Institut Teknologi Bandung)

Co-Chair

- Ir. Noor Iza M.Sc (Sekolah Tinggi Multi Media Yogyakarta)

Organizing Committee

- Dr. Fadhil Hidayat (Institut Teknologi Bandung)

Steering Committee

- Prof. Jaka Sembiring (Institut Teknologi Bandung)
- Prof. Suhardi (Institut Teknologi Bandung)
- I Gusti Bagus Baskara Nugraha, Ph.D (Institut Teknologi Bandung)
- Dr. Shinto Dwirawati SH, S.Sos .MA (Sekolah Tinggi Multi Media Yogyakarta)
- Siti Sarifah M.PT M.Si (Sekolah Tinggi Multi Media Yogyakarta)
- Ridwan Zella Vado ST. M.Eng (Sekolah Tinggi Multi Media Yogyakarta)
- Andi Irfan Mastulen MM (Sekolah Tinggi Multi Media Yogyakarta)
- Muhammad ST, MM (Sekolah Tinggi Multi Media Yogyakarta)
- Tegus Kristianta SE (Sekolah Tinggi Multi Media Yogyakarta)
- Yolanda Presiana Dessy, S.IP MA (Sekolah Tinggi Multi Media Yogyakarta)
- Endah Fitri Susanti SH (Sekolah Tinggi Multi Media Yogyakarta)

Finance

- Yuni Hafsa (Institut Teknologi Bandung)
- Noviandari Prabawati, SES, M.BA (Sekolah Tinggi Multi Media Yogyakarta)

Technical Programme

- Dr. Arry Akhmad Arman (Institut Teknologi Bandung)
- Dr. Fetty Fitriyanti Lubis (Institut Teknologi Bandung)
- Dr. Y. Bandung (Institut Teknologi Bandung)
- Hastie Audytra, S.Kom., MT (Institut Teknologi Bandung)
- Ir. Yusuf Ayuba, S.Kom., MM (Institut Teknologi Bandung)
- Ahmad Ali Hakam Dani, ST., MT (Institut Teknologi Bandung)
- Davy Ronald Hermanus, S.Si., M.Kom. (Institut Teknologi Bandung)

Events

- Siti Chotijah S.IP MA (Sekolah Tinggi Multi Media Yogyakarta)
- Muhammad Wisynu Kurniawan ST, M.Eng (Sekolah Tinggi Multi Media Yogyakarta)
- RB Hendri Kuswanto S.Kom, M.Kom (Sekolah Tinggi Multi Media Yogyakarta)
- Muhammad Fakhri Syukri (Institut Teknologi Bandung)
- Robby Suparyogi Eka Rahman, S.I.Kom. (Institut Teknologi Bandung)
- Triska Nurita (Institut Teknologi Bandung)
- Muhammad Grevy Firzatullah (Institut Teknologi Bandung)
- Muhammad Kaelaani Saeful Falah, S.Ds (Institut Teknologi Bandung)

Secretariat

- Siti Insani, M.B.A. (Institut Teknologi Bandung)
- Donna Pascalina, M.Kom. (Institut Teknologi Bandung)
- Gilang Pangestu S., S.T. (Institut Teknologi Bandung)

Keynote Speaker

1. **Budi Arie Setiadi**, Indonesian Minister of Communication and Information
2. **Prof. Zudan Arif Fakrulloh**, Acting Governor of South Sulawesi
3. **Prof. Suhono Harso Supangkat**, Director of Smart City & Community Innovation Centre, Bandung Institute of Technology
4. **Prof. Dr. Ir. Jaka Sembiring, M.Eng.**, Vice Rector for Education and Student Affairs, Bandung Institute of Technology
5. **Ir. Noor Iza, M.Sc.**, Head of School of Multi Media Yogyakarta “MMTC”
6. **Prof. Kayoko Yamamoto**, University of Electro-Communications, Tokyo
7. **Garcia Reyes**, Assistant Professor in Structural Engineering, The University of Warwick
8. **David Klingberg**, Smart Planning and Design Australia
9. **Dr. Lukito Edi Nugroho**, Senior Lecturer, Department of Electrical and Information Engineering, University of Gadjah Mada
10. **Haryo Teguh Putranto**, Head of Strategic Partnership Mobile Experience B2B, PT Samsung Electronics Indonesia

Advisory Board

- **Minister of Communication & Information Technology Republic of Indonesia**
- **Minister of Education & Culture Republic of Indonesia**
- **Rector Bandung Institute of Technology (ITB)**
- **Prof. Suhono Harso Supangkat** (Bandung Institute of Technology)

General Chair

- **Prof. Suhono Harso Supangkat** (Bandung Institute of Technology)

Organizing Committee

- **Fadhil Hidayat** (Bandung Institute of Technology)

Steering Committee

1. **Jaka Sembiring** (Bandung Institute of Technology)
2. **Arry Akhmad Arman** (Bandung Institute of Technology)
3. **Suhardi** (Bandung Institute of Technology)
4. **Fetty Fitriyanti Lubis** (Bandung Institute of Technology)
5. **I Gusti Bagus Baskara Nugraha** (Bandung Institute of Technology)
6. **Yoanes Bandung** (Bandung Institute of Technology)
7. **Achmad Iman Kistijantoro** (Bandung Institute of Technology)
8. **Hammam Riza** (National Research and Innovation Agency)

Keynote Speaker

1. **Prof. Junseok Hwang**
(Professor of Technology Management, Economics and Policy Program - Seoul National University)
2. **Prof. Mohamed Essaaidi**
(ENSIAS, Mohammed V University in Rabat)
3. **Prof. Dr Toshio Obi**
(Waseda University)
4. **Prof. Suhono Harso Supangkat**
(Smart City & Community Innovation Centre - Bandung Institute of Technology ITB)
5. **Prof. Dr. Ir. Hammam Riza, M.Sc, IPU**
(Principal Expert, National Research and Innovation Agency (BRIN)
President of KORIKA, Indonesia)
6. **Dr. Venkatachalam Anbumozhi**
(Director of Research Strategy and Innovation
- Economic Research Institute for ASEAN and East Asia)

2022 International Conference on ICT for Smart Society (ICISS)

TABLE OF CONTENTS

No	Title	Author	Page No
1	Robotic Process Automation in Smart System Platform: A Review	Noor Falih, Suhono Harso Supangkat and Fetty Fitriyanti Lubis	1-5
2	Digital Payment Technology for SMEs: Can it be Adopted and Use Properly?	Arie Gunawan, Fatya Amalia and Tjetjep Djatnika	6-11
3	Predicting Smart Regency Readiness on Sub-Urban Area in Indonesia: A perspective of Technology Readiness Index 2.0	Aang Kisnu Darmawan, Muhsi Muhsi, Mohammad Waail Al Wajieh, Mohammad Bhanu Setyawan, Agus Komarudin and Fathorrozi Ariyanto	12-17
4	Jaebot: Discord Bot for Network Analysis with NetworkX	Jeconiah Richard, Rowin Faadhilah and Nunung Nurul Qomariyah	18-23
5	Safe and Secure Railway Station: A Systematic Review	Ulva Elviani and Fadhil Hidayat	24-28
6	Gamification for E-Tourism Based on Virtual Reality Study on Indonesia Tourism	Winanti, Yoga Prihastomo, Francicsa Sestri Goestjahjanti, Dwi Ferdiyatmoko Cahya Kumoro, Imam Subekhi, Nanang Chaeroni, Ahadi, Arif Budi Hermawan and Siti Abadiyah	29-34
7	The utilization of Zoom and Microsoft Teams in maximizing the implementation of Flipped Learning and Students' Learning Experience in English for Written Business Class Bina Nusantara University	Norma Pawestri, Marisca Revani Putri and Venansia Ajeng Surya Ariyani Pedo	35-41
8	Development of Smart City Sustainable Key Performance Indicators in line with IT Infrastructure Library	Wahyu Adi Prabowo and Ade Tiara Rosalinda	42-46
9	Effect of Overall Brand Equity and Perceived Value On The Purchase Intention of Smart Home Appliances In Indonesia	Lim Sanny, Audrey Halim and Ivana Wijaya	47-54
10	Cyber-Physical System Framework for Cerebrovascular Accidents using Machine Learning Algorithm	Roman M. Richard and Jonathan V. Taylar	55-59
11	A Review of Blockchain for Security Data Privacy with Metaverse	Safriadi M Yunus Aks, Mila Karmila, Bryan Givan, Gempa Hendratna, Heri Satria Setiawan,	60-64

No	Title	Author	Page No
		Arman Syah Putra, Slamet Heri Winarno, Tukhamun Adi Kurniawan, Yosua Novembrianto Simorangkir, Rohmat Taufiq, Mety Titin Herawaty and Asep	
12	Incorporating Machine Learning Algorithms to Detect Phishing Websites	Nusrat Jahan Sinthiya, Tanvir Ahmed Chowdhury and A K M Bahalul Haque	65-69
13	Mediation Model of E-Learning Adoption	Norfaridatul Akmaliah Othman, Doni Purnama Alamsyah and Satrio Matin Utomo	70-73
14	Toward an E-Learning Adoption: Student Perspectives	Indriana, Doni Purnama Alamsyah and Norfaridatul Akmaliah Othman	74-78
15	Model of Relative Advantage on Mobile Payment: The Support of Responsiveness and Smartness	Leni Susanti and Doni Purnama Alamsyah	79-87
16	Citizens' Trust in Smart Governance During COVID-19 Pandemic	Wahyu Eko Yudiatmaja, Emmy Solina, Edward Mandala, Mohammad Kus Yunanto, Tri Samnuzulsari and Diah Siti Utari	88-93
17	Implication of Low-Code Development Platform on Use Case Point Methods	Abdurrasyid, Meilia Nur Indah Susanti and Indrianto	94-99
18	Identifying Narrations on the Social Media Discourse of Moving the Indonesia's Capital City using Textual Network Analysis	Delfirman, Rudy G. Erwinsyah, Bilal As'Adhanayadi, Nuzul Solekah and Ririn Purba	100-108
19	Classification of Drug Effectiveness Based on Patient's Condition Using Text Mining With K-Nearest Neighbor	Deny Haryadi, Dewi Marini Umi Atmaja, Arif Rahman Hakim and Wina Witanti	109-114
20	Developing an E-Flipbook on Environmental Education to Promote Digital Literacy among Elementary School Students and Teachers in Rural Areas in Indonesia	Qumillaila, Ayu Putri Lestari, Yasunobu Kuboki and Fadilah Hasim	115-120
21	Bitcoin Price Forecasting using Time-series Architectures	Louise Gabriel N. De Leon, Rafael C. Gomez, Martin Lance G. Tacal, Jonathan V. Taylar, Verlyn V. Nojor and Alonica R. Villanueva	121-127
22	Implementation of Convolutional Neural Network on Farming Robots for Detecting Broccoli	Yohanssen Pratama, Isdaryanto Iskandar and Pelindung T.P. Giawa	128-133
23	Manufacturing a Smart Locker Security System for Public Spaces using E-KTP as a Primary Access	Andi Pramono, M. Aldiki Febriantono, Ira Audia Agustina, Ida Bagus Ananta Wijaya, Tiara Ika Widia Primadani and Satrio Arif Budiman	134-139
24	Application of Natural Language Processing	Alonica Villanueva, Christian	140-146

No	Title	Author	Page No
	for Phishing detection using Machine and Deep Learning models	Atibagos, Jericko De Guzman, John Carlo Dela Cruz, Menchie Rosales, and Ryan Francisco	
25	The Investigation of Student Engagement as Mediator in ICT Readiness and Experience on E-Learning Effectiveness in Post-Pandemic Recovery	Rona Nisa Sofia Amriza, Yudha Saintika and Aruga Yudish Firmansyah	147-154
26	Automatic Target Recognition and Identification for Military Ground-to-Air Observation Tasks using Support Vector Machine and Information Fusion	Arwin Datumaya Wahyudi Sumari, Aldi Surya Pranata, Irsyad Arif Mashudi, Ika Noer Syamsiana and Catherine Olivia Sereati	155-160
27	Face Morph Detection: A Systematic Review	Rezza Fauzy Sucipto and Fadhil Hidayat	161-166
28	Bacterial Detection in Water: A Systematic Literature Review	Dwi Diana Wazaumi and Fadhil Hidayat	167-170
29	Digital Transformation Framework: A Review	Radiant Victor Imbar, Suhono Harso Supangkat, Armein Z. R. Langi and Arry Akhmad Arman	171-176
30	ARTTS: PLHIV Monitoring System on Treatment and Antiretroviral Therapy with Analytics and Social Integration	John Rogel DC. Mallari, Jude G. Matira, Amzen D. Ramos and Alfio I. Regla	177-182
31	Linkedin's Influence on User Success in The Professional World	Tanty Oktavia, Faza Fakhriansyah Roekman, Muhammad Ikhsan Putera, Muhammad Alif Hidayah, Muhammad Rafi, Takaaki Hosoda and Ford Lumban Gaol	183-187
32	Understanding People Analytics Adoption to Support Higher Education Competitive Advantages: A Literature Review	Sekar Wulan Prasetyaningtyas, Abdul Rohman, Minaldi Loeis, Samuel Mahatmaputra and Michael Siek	188-193
33	Digital Transformation for Entrepreneurship Education in Vocational High School: A Case Study	Sekar Wulan Prasetyaningtyas, Artha Sejati Ananda, Janita Sembiring Meliala and Ayub Simon Petrus Sanam	194-199
34	Studying the Performance of Transfer Learning on CNN Models for Fruit Sorting	Beauty Tatenda Tasara and Nunung Nurul Qomariyah	200-203
35	Using an Extended UTAUT Theory to Examine the Consumer Behavior of m-Health Apps: Preliminary Results	Sevenpri Candra, Arnold Yandy Williar, Elfindah Princes, Ooi Kok Loang, Gilbert Delphin and Ida Nyoman Basmantra	204-208
36	Design of Mass Rapid Transit Phase 2 Optical Fiber Network for Backbone Communication	Amadika Daffa Verlinan, Fauzan Hiroki Imam, Anis Mumtaz Atsilah, Nanda Ilham Harahap, Muhammad Wildan Nugraha and Catur Apriono	209-212
37	Designing of Integration Systems for IoT	Ahmad Nurul Fajar, Riyanto Jayadi,	213-220

No	Title	Author	Page No
	Urban Farming: Mobile and Web Application	Astari Retnowardhani, Billy Robertson and Jayadi Halim	
38	Architectural Framework Factor for E-Government in Indonesian Construction Services Sector	Dewi Chomistriana and Manlian Ronald A. Simanjuntak	221-225
39	Evaluation Host-to-Host Data Integration Implementation Project Case Study : PT Jasa Raharja	Dwi Ria Nugraha, Achmad Nizar Hidayanto and Teguh Raharjo	226-231
40	Design of Internet of Things for Smart Residence	Betha Zionetha Mailoa, Kanka Wiemas Naufal Ghiffari, Dhiya Mahdi Asriny, Yeni Ernawati and Nilo Legowo	232-237
41	Talk to Me: Artificial Intelligence “Virtual Friend” for Depression Sufferers Using Term Frequency – Inverse Document Frequency (TF-IDF) and Finite State Machine Method	Hanif Fakhurroja, Tanrida Utari, Andy Victor and Oka Mahendra	238-242
42	Violent Videos Classification Using Wavelet and Support Vector Machine	Atik Wintarti, Riskyana Dewi Intan Puspitasari and Elly Matul Imah	243-249
43	Design and Simulation of the Multistage Constant-Current Charging System with Passive Balance BMS for Lithium-Ion Batteries	Agus Ramelan, Firmansyah Abada, Muhammad Nizam, Feri Adriyanto, Meiyanto Eko Sulistyoyo, Chico Hermanu Brillianto Apribowo and Ayu Latifah	250-255
44	Predictive Maintenance on Railway Turnout System: A Systematic Literature Review	Zastra Alfarezi Pratama and Fadhil Hidayat	256-263
45	Design and Simulation of Monitoring Current, Voltage, and Temperature of 60WP Solar Panel Using Solar Tracker, Passive Cooling, and Reflector	Agus Ramelan, Annisa Larasati Febrianingrum, Feri Adriyanto, Meiyanto Eko Sulistyoyo and Muhammad Adli Rizqulloh	264-268
46	Serious Game Application Development for Learning Battle of Surabaya	Robinarido Ekariski Rinaldi, Marco Thomas Wihartono, Ryan Eka Dharmalim and Suharjito	269-276
47	Digital Transformation of Health Service through Application Development in Handling COVID-19 in Indonesia	Amandita Ainur Rohmah, Rini Rachmawati and Estuning Tyas Wulan Mei	277-281
48	Applying Image Classification for Detect Leaf Disease: Case Study for Porang Plant	Fayyadh Ats Tsaqib Marwan and Dedi Rimantho	282-288
49	Proposing Enterprise Architecture for Smart Regencies in Indonesia: A Perspective of Zachman Framework(ZF)	Aang Kisnu Darmawan, Fauzan Masykur, Muhsi Muhsi, Busro Akramul Umam and Rofiuddin Rofiuddin	289-293
50	Using Certainty Factor for Symptoms Diagnosis of Thyroid Disorders	Enti Hariadha, Dian Nugraha, Rosyid Ridlo Al Hakim, Agung Pangestu, Muhammad Yusro and Muhammad Haikal Satria	294-298

No	Title	Author	Page No
51	User Acceptance of Technologies Adoption in Courier Management System with TAM	Alfio I. Regla and Rossian V. Perea	299-303
52	Analysis of the use of Information System for Accumulating Sex-Disaggregated Data with Analytics of the Barangay Constituents using the Technology Acceptance Model	Rossian V. Perea and Alfio I. Regla	304-307
53	STR-DNA Matching and Family Relation Using Bayesian Inference	Maria Susan Anggreainy, Nurtami Soedarsono and Belawati H. Widjaja	308-314
54	Analysis of The Critical Factors Influence Smart Regency Development with Interpretive Structural Modelling(ISM) Approach	Aang Kisnu Darmawan, Mohammad Waail Al Wajieh, Agus Komarudin, Mohammad Bhanu Setyawan, Busro Akramul Umam and Rofiuddin Rofiuddin	315-319
55	Smart Helmet Integrated with Motorcycles to Support Rider Awareness and Safety Based Internet of Things	Somantri and Indra Yustiana	320-325
56	Evaluation of Benchmarking Pre-Trained CNN Model for Autonomous Vehicles Object Detection in Mixed Traffic	Afdhal Afdhal, Nasaruddin Nasaruddin, Zahrul Fuadi, Sugiarto Sugiarto, Hammam Riza and Khairun Saddami	326-331
57	A Smart Aquaponic System for Enhancing The Revenue of Farmers in Sri Lanka	Dhanushka Ekanayake, Pubudu de Alwis, Pasindu Harshana, Dilusha Munasinghe, Anuradha Jayakody and Narmada Gamage	332-337
58	Data Governance Maturity Assessment: A Case Study Directorate General of Corrections	Ikhsan Mirza Harwanto and Achmad Nizar Hidayanto	338-343
59	Effect of Pre-processing Dataset on Classification Performance of Deep Learning Model for Detection of Oil Palm Fruit Ripe	Suharjito, Eduard Pangestu Wonohardjo, Devriady Pratama, Taufik Roni Sahroni, Ryan Alpha August and Marimin	344-348
60	A Research Study on User Satisfaction of PeduliLindungi Application	Anindito Pradeva Purwoko, Firel Athalia Firsyada, Ravanka Bayhaqi and Natalia Limantara	349-354
61	Utilization of ICT in Maintaining Social Resilience in Rural Indonesia	Nyi R. Irmayani, Habibullah Habibullah, B. Mujiyadi, Nurhayu Nurhayu and Rudy G. Erwinsyah	355-361
62	Comparison of CNN and DNN Performance on Intrusion Detection System	Muhammad Arief and Suhono Harso Supangkat	362-367
63	O-RAN Intelligent Application for Cellular Mobility Management	Baud Haryo Prananto, Iskandar and Adit Kurniawan	368-373
64	ERP in Indonesia SMEs: a Study for Post Implementation Evaluation from User's Perspective Acceptance	Todoan Siregar, Warih Puspitasari and Muhardi Saputra	374-380
65	Developing Sentiment Analysis of Indonesian Social Media Based on Convolutional Neural	Dian Isnaeni Nurul Afra, Agung Santosa, Radhiyatul Fajri, Nurasia	381-384

No	Title	Author	Page No
	Network for Smarter Society	Novia Hidayati, Elvira Nurfadhilah, Siska Pebiana, Lyla Ruslana Aini, Harnum Annisa Prafitia, Yosi Sahreza, Junanto Prihantoro, Gunarso Gunarso, Andi Djalal Latief, Mohammad Teduh Uliniansyah and Hammam Riza	
66	Recommendation System for the Improvement of E-Government Services in the Tourism Sector of Pontianak City	Ilhamsyah, Syahru Rahmayudha, Izhan Fakhruzi, Ferdy Febrianto, Ahmad Cahyono Adi and Veri Gunawan	385-389
67	Repurchase Intention: System Quality, Service Quality, Information Quality, and Customer Experience on M-Commerce in Indonesia	Rudy, Rizki Maulana Akbar, Muhammad Mahdy Satria and Muhammad Arya Hidayat Pradana	390-395
68	Development of Virtual Support Application for Sexual and Gender-Based Violence Victims	Mauee Czelsie Samaniego, Risty Acerado, Aiza Jane Sulit and Roselia Morco	396-400
69	Toward Automation of Structural Health Monitoring: An AI Use Case For Infrastructure Resilience in A Smart City Setting	Muhammad Dirhamsyah, Israr B. M. Ibrahim, Syarizal Fonna, Teuku Arriessa Sukhairi, Hammam Riza and Syifaul Huzni	401-404
70	Analysis of Factors Affecting The Use of Electronic Money	Tanty Oktavia, Natanael David Wibowo, Putri Maharani, Inaya Nabila Putri, Jason Tianwin and Chattherin Vyanni	405-411
71	Penetration Testing on Web Application Using Insecure Direct Object References (IDOR) Method	I Putu Agus Eka Pratama and Alvin Maulana Rhusuli	412-417
72	Comparison Several Regression Algorithms for Prediction of Job Satisfaction	Handy Darmawan, Cherise Earlene, Eric, Budi Juarto and Felix Indra Kurniadi	418-423
73	Combination of Digital Twin and Augmented Reality: A Literature Review	Ahmad Ali Hakam Dani and Suhono Harso Supangkat	424-428
74	Autonomous Drone Indoor Navigation Based on Virtual 3D Map Reference	Jonathan Putra and Dany Eka Saputra	429-433
75	Predicting License Plate Prices using Machine and Deep Learning	Fardin Ahsan, Noman Sheikh and Jinane Mounsef	434-439
76	Applying Action Design Research to Digital Social Innovation: A Case of Automated Flood Detection System in Rural Region	Moh Aqsa Almubaraks, Risma Nur Damayanti and Luthfi Ramadani	440-444
77	Smart Villages in Indonesia in the Light of the Literature Review	Wahyudi Agustiono	445-455
78	Smart Tourism Destinations Research Trend: A Systematic Literature Review	Siti Elda Hiererra, Meyliana, Arief Ramadhan and Fredy Purnomo	456-461
79	Social Innovation and Local Initiatives as Part	Henny Warsilah, Yoka Pramadi,	462-467

No	Title	Author	Page No
	of Smart Society: Case Study of Urban Kampongs in Semarang and Batam Smart Cities	Rusydhan Fathy, Praditya Mer Hananto and Galuh Syahbana Indraprahasta	
80	GreenSoal:Illegal Tree Logging Detection System Using IOT	H.M.K.S. Bandaranayake, D.M.M.Y.P. Mahamohottala, W M A M Wijekoon, K.M.V.T. Sandakelum, Narmada Gamage and Windhya Rankothge	468-473
81	Development of Financial Planner Application Software Based on Waterfall Model	Jason Imanuel, Lusia Kintanswari, Vincent, Maria Susan Anggreainy, Sablin Yusuf and Sula Yosege Sembiring Kembaren	474-480
82	Boltuino Platform Based Cognitive Irrigation System with Weather Adaptability for Efficient Water Use	Ashim Mondal and Pallav Dutta	481-485
83	Predicting The Occupation Progress of A Person Using Decision Tree-Based Analysis	Rossian V. Perea	486-490
84	Post Quantum Cryptography: Comparison between RSA and McEliece	I Putu Agus Eka Pratama and I Gusti Ngurah Agung Krisna Adhitya	491-496
85	Fuzzy Adaptive Items in Design Activity of Appreciative Serious Game	Hanny Haryanto, Aripin, Acun Kardianawati, Umi Rosyidah, Edy Mulyanto and T. Sutojo	497-503
86	Metaverse Fundamental Technologies for Smart City: A Literature Review	Ahmad Tarmizan Kusuma and Suhono Harso Supangkat	504-508
87	Framework for Developing Smart City Models in Indonesian Cities (Based On Garuda Smart City Framework)	Bobi Kurniawan, Suhono Supangkat, Ford Lumban Gaol and Benny Ranti	509-513
88	Intelligent Digital Enterprise Architecture: Perspectives, Trends, and Technologies	Nunik Afriliana, Ford Lumban Gaol, Suhono Harso Supangkat and Benny Ranti	514-518
89	Architecture Open Workspace Concept for Prescriptive Model of Digital Twin	Ayu Latifah, Suhono Harso Supangkat, Edi Leksono, Agus Ramelan and Ayu Latifah	519-526
90	Gamification in Sustainable Smart Tourism Destination Model: A Systematic Review	Siti Elda Hiererra, Arief Ramadhan and Suhono Harso Supangkat	527-532
91	Room Management based Machine Learning and Data Analytics: Concept Overview	Ayu Latifah and Agus Ramelan	533-537
92	Design a Non-Banking Financial Transfer Platform for Cooperative Communities	Muhamad Yani and Albarda Albarda	538-541
93	Throwing Activity Detection Using CCTV and Video Analytics for Safety and Security in Railway Station	Vincentius Ian Widi Nugroho and Fadhil Hidayat	542-545
94	Trespassing Detection using CCTV and Video Analytics for Safety and Security in Railway Stations	Hollyana Puteri Haryono and Fadhil Hidayat	546-549

Talk to Me: Artificial Intelligence “Virtual Friend” for Depression Sufferers Using Term Frequency – Inverse Document Frequency (TF-IDF) and Finite State Machine Method

1st Hanif Fakhurroja
Faculty of Industrial Engineering
Telkom University
National Research and Innovation Agency
Bandung, West Java, Indonesia
haniff@telkomuniversity.ac.id

3rd Andy Victor
School of Management Informatics & Computer LPKIA
Bandung, West Java, Indonesia
abang@lpkia.ac.id

2nd Tanrida Utari
School of Management Informatics & Computer LPKIA
Bandung, West Java, Indonesia
161014042@fellow.lpkia.ac.id

4th Oka Mahendra
Research Organization for Electronics & Informatics
National Research and Innovation Agency
Bandung, West Java, Indonesia
oka.mahendra@brin.go.id

Abstract—Depression refers to mental health in which a person experiences a bad mood and has a decreased quality of life. In Indonesia, there are quite a lot of challenges in dealing with depression problems such as lack of education on how to treat depression, lack of mental health personnel, and the emergence of a bad stigma against depression sufferers. Voice-based artificial intelligence technology for people with depression was developed to play a role in filling the gap by acting as a support system. In this research, the Natural Language Processing (NLP) method is used to enable computer to be able to understand the user’s input. TF-IDF (The Term Frequency-Inverse Document Frequency) method is also used to weight documents and the Finite State Machine (FSM) method used to classify the results of document weighting against a predetermined dialogue scenario. To be able to interact with the system, the author uses the Google Cloud Speech API technology to convert speech and text. As for testing of this system, it is done by calculating the level of accuracy of the answers given by the system to users. The level of accuracy of the system answers obtained from the test results is 96.5%. The accuracy value indicates that the answer given by the system is in accordance with what the user’s input.

Keywords— *Depression; Artificial Intelligence; NLP; TF-IDF; FSM*

I. INTRODUCTION

Depression is a mental health disorder related to mood. A person who is depressed will feel unmotivated, hopeless, and lose interest in activities [1]. Some people think that depression is a trivial thing and will go away by itself, but the fact is that depression is a form of disorder that is more than just a temporary emotional change [2]. According to the World Health Organization, there are more than 264 million people in the world suffering from depression, and nearly 800,000 people each year choose to end their lives because of their depression. The effects of depression itself can last for a long time and repeat itself, which will result in a decrease in the function of one's body. The causes of depression include the complex interactions between biological factors, social, and psychological. Unattended depression will lead to sufferers’ suicidal thoughts. In 2015, suicide was ranked

number two in the cause of death for a person aged 15-29 years [3].

In Indonesia, based on the results of the Basic Health Research of the Ministry of Health in 2018, the prevalence rate of depression for the age group ≥ 15 years is 6.1%. According to that, only 9% of people with depression undergo medical treatment [4]. There are many challenges in dealing with depression, such as the stigma for people with depression being labelled abnormal and often associated with mystical things. Moreover, the health services provided ranging from facilities to practitioners are not yet qualified. Indonesia only has 773 psychiatrists and 451 clinical psychologists centered on the island of Java, a very small number when compared to Indonesia's population of approximately 260 million people. This means that 1 (one) trained psychiatrist must handle 300,000–400,000 people. WHO determines that the ratio of the number of psychologists and psychiatrists to the total population should be 1 per 30 thousand people. That means, Indonesia still lacks around 24,000 mental practitioners [5]. Time and cost limitations are also an obstacle for depression sufferers to get help from psychologists [6].

Anyone can experience depression. In fact, everyone has a different pattern of depression. For example, some people experience major depression for a short time, but some people experience mild depression for a very long time [7]. Therefore, based on the background provided, the authors are interested in developing an artificial intelligence technology in Bahasa using the Natural Language Processing method, TF-IDF, and FSM where these methods focus on natural language processing and answer classification so that later it allows the computer to be able to understand the language entered by the user and be able to provide answers in accordance with what the user inputs [8][9]. For the development of the system itself, the author adds a voice-based conversation mode so that when used, users can more easily tell what they are thinking and feeling.

II. RELATED WORKS

The rapid development of technology has succeeded in encouraging humans to create many things to facilitate their work, including in the field of mental health. In fact, everyone always tells about what they feel when they get happiness or face sadness in their immediate environment [10]. In the case of depression, at least the sufferer needs someone to listen to all the complaints they have. However, based on the background that has been described there are many challenges in meeting these needs. Along with the times, nowadays many technologies have been developed for human mental health. There are some of the studies for depression or mental health that have been developed previously, for example Expert System Application for Diagnosis of Levels of Depression in Teenage based on Android [11], Expert System Determines Depression Levels of Layed Workers Using Certainly Factor Method [12], and Expert System to Determine Student Anxiety Levels in Writing Thesis Using the Multi Factor Evaluation Process and Tsukamoto Fuzzy Inference Method [13].

The development of expert system applications assists psychologists in making treatment decisions for depressed patients. It focuses on early detection of the level of depression that occurs in a person [11]. As for the depression category, researchers used four levels, that is Mood Disorders, Mild Depression, Moderate Depression, and Major Depression. The application developed consists of several stages, one of which is the Forward Chaining method. This method is one of the main methods of reasoning in using an inference engine (decision making machine). It can logically describe as a repetition application of the modus ponens (a set of inference rules and valid arguments) [14]. In general, this expert system application works by receiving input in the form of symptoms of depression experienced by users. Then the system will process the data and produce output in the form of depression levels and a large percentage of depressive symptoms using the Forward Chaining method. The results of the study using 15 sample data. It was found that the level of accuracy resulting from the application of this method was 93%, where these results prove that the application of Forward Chaining method for expert system applications is very accurate.

Termination of employment by companies is a frightening specter for employees. The emergence of various emotions when experiencing layoffs will certainly affect a person's mental health greatly. A person who is laid off can experience various changes that are in stark contrast, such as deep sadness, disappointment, hopelessness, and even separation from his social life. The development of expert system application that can detect the level of depression in laid-off workers by using the Certainly Factor method. Meanwhile, the Certainly Factor method is a clinical parameter value given by MYCIN to show the amount of trust [15]. In the case study, the level of depression used was divided into three parts, namely Mild Depression, Moderate Depression, and Major Depression. From the results of testing conducted on case studies of workers A, B, and C, it was found that the percentage of depression suffered by worker A was 29%, worker B was 44%, and worker C was 47%.

In Indonesia, writing a thesis is an absolute requirement for bachelor students to obtain a Bachelor's degree. For final semester students, the frustration of working on their thesis always appears. The frustration when working on this thesis can cause symptoms of depression [16]. Other research

develops a prototype expert system to detect the level of anxiety in final year students who are compiling their thesis. This research uses the MFEP (Multi Factor Evaluation Process) and Fuzzy Tsukamoto Inference method. According to Render B and Stair, the MFEP is a quantitative method that uses a weighting system. In multifactor decision making, decision makers subjectively and intuitively weigh various factors or criteria that have an important influence on the alternative choices [17]. Meanwhile, fuzzy logic is used to translate a quantity that is expressed using language. During the rule evaluation process in the inference engine, the Fuzzy Tsukamoto method uses the MIN implication function to get the α -predicate value for each rule [18]. The results of the study using 52 test data, both system prototypes and experts have resulted those 42 data (81%) are suitable and 10 data (19%) are not suitable. The system prototype designed by implementing the MFEP method and Fuzzy Tsukamoto Inference can be used to assist in determining the level of student anxiety in compiling a thesis with a success rate of 81%.

III. PROPOSED METHOD

The dialogue management system design architecture used in this study can be seen in the Fig. 1.

In this study, the authors designed a dialogue management system with six dialogue scenarios based on three categories of speech. The following are the dialog categories that have been designed. In Table I the dialog scenario will be described in a dialogue session between application users and the Talk to Me system. Table II is an example of a dialogue session for the Desperate category, the D1 Life dialog classification that has been created for app users to chat with the Talk to Me system.

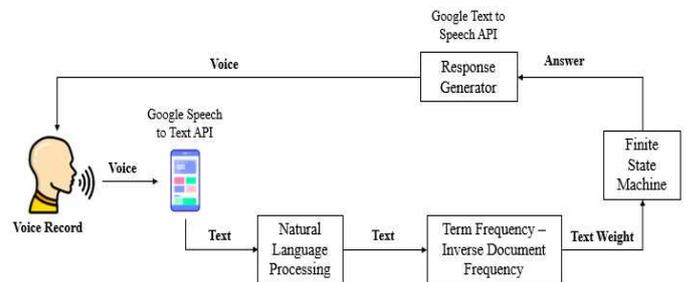


Fig. 1. Talk to Me system design.

TABLE I. DIALOGUE SCENARIO

Categories	Dialogue Classification	Keyword of Dialogue Scenario
Putus Asa (Desperate)	D1 Kehidupan D1 Life	<i>Aku ingin mati</i> (I want to die)
	D2 Bullying	<i>Aku dibully</i> (I am being bullied)
Stress	D3 Bullying	<i>Aku diperlakukan tidak baik</i> (I was mistreated)
	D4 Keluarga (D4 Family)	<i>Keluargaku hancur</i> (My family is broken)
Trauma	D5 Percintaan (D5 Love)	<i>Aku putus dengan pacarku</i> (I broke up with my boyfriend/girlfriend)
	D6 Bullying	<i>Aku dihina</i> (I was insulted)

TABLE II. DIALOGUE SCENARIO 1 (D1)

Dialogue Scenario 1 (D1)	
User	: <i>Aku merasa putus asa</i> (I feel desperate)
Talk to Me	: <i>Apakah kamu mau cerita?</i> (Do you want to talk about it?)
User	: <i>Aku cape dengan hidup ini</i> (I am tired of this life)
Talk to Me	: <i>Ada banyak alasan yang bikin kita cape.</i> <i>Apa kamu sering merasa seperti ini?</i> (There are so many reasons to feel tired. Do you always feel like this?)
User	: <i>Aku merasa seperti ini jika aku sedang sendirian</i> (I feel like this when I am alone)
Talk to Me	: <i>Aku ada disini untukmu, jangan pernah merasa sendirian</i> (I am here for you, do not feel that you are alone)
User	: <i>Aku ingin mati saja</i> (I want to die)
Talk to Me	: <i>Apakah kamu berpikir untuk mengakhiri hidup?</i> (Are you thinking to end your life?)
User	: <i>Ya</i> (Yes)
Talk to Me	: <i>Aku tidak bisa membayangkan betapa menyakitkannya perasaan itu, tapi aku ingin mencoba untuk memahami situasimu saat ini. Tidak ada yang lebih penting selain apa yang kamu rasakan. Jangan pernah menyerah, aku yakin banyak sekali orang yang peduli terdahapmu. Kami tidak ingin kehilangan seseorang yang berharga seperti dirimu. Mari kita berjuang untuk menghadapi semua ini.</i> (I can't imagine how painful that feeling is, but I want to try to understand your current situation. Nothing is more important than how you feel. Don't ever give up, I'm sure a lot of people care about you. We don't want to lose someone as precious as you. Let's fight for all of this.)

A. Speech Recognition using Google Cloud Speech API

Speech Recognition is the process of converting a digital signal that converts sound waves into a set of numbers which are then matched with a pattern stored on a device [19]. In short, Speech Recognition is a process used to recognize the speech of a person [20]. The system designed in this study is a dialogue management system using the Indonesian language for human interaction with voice-based applications so that speech recognition uses the Google Cloud Speech API.

The author chooses to use the Google Cloud Speech API because it can be accessed for free for the cloud-based speech recognizer [21]. In addition, the Google Cloud Speech API itself has experienced rapid development by having 120 language options including Indonesian. The main purpose of this voice recognition technology is to enter commands in the form of a voice into the machine so that the machine is able to understand and process it directly [22].

B. Natural Language Processing (NLP)

Natural Language Processing is a computational technique used to analyse and represent text written naturally (human language) at one or more levels of linguistic analysis with to

obtain human like language processing that can be implemented in various fields [23]. The series of processes of NLP used in this study include case folding, tokenizing, filtering, and stemming. Case folding is used to change all uppercase letters in sentences to lowercase letters, tokenizing is used to break sentences into pieces of words, filtering is used to carry out the retrieval or filtering steps for words that are important in sentence, and the last is stemming, which is making changes to the whole sentence to become a root word by removing the affix from each document. Stemming in Indonesian itself has a more complex structure than stemming in English [24]. After all the series of processes have been completed, the data will be processed by TF-IDF.

C. Term Frequency – Inverse Document Frequency (TF-IDF)

Term Frequency-Inverse Document Frequency, abbreviated as TF-IDF, is a statistical calculation method intended to indicate how important a word is to a document in a corpus or database. This method is often used as a weighting factor for information retrieval and text mining. This method serves to give weight to each word that appears and calculate the inverse of the existing sentence frequency [25]. The results of the assessment depend on whether the question term is present or not in the dialogue sentence document zone. It lies in the sentence in the data set that contains more terms in the question and is related to the question, therefore the sentence has a higher score. For tf is a local parameter that calculates the frequency of each term t in the sentence document d , so that $f_{t,d}$ means the frequency of occurrence of the terms t to i in sentences d to j .

$$tf(t_i, d_j) = f_{t,d} \quad (1)$$

The global parameter that is idf is the inverse frequency of the sentence, idf calculates the inverse of the occurrence of the term in the dialog dataset, where D is a set of sentences in the dialogue scenario.

$$idf(t_i, D) = 1 + \log \frac{D}{d(t_i)} \quad (2)$$

Therefore, the TF-IDF equation is used to give the weight of the sentence document d into term t .

$$w(t_i, d_j) = tf(t_i, d_j) * idf(t_i, D) \quad (3)$$

The frequency for this term is used to improve memory in search of information but cannot be ascertained to increase precision. Words with a high TF-IDF value imply a strong relationship with the dialogue that appears.

The design of the TF-IDF method is used as a method for giving weight to dialogue sentences in the answer dataset in the Talk to Me system. The following is a flow chart of how TF-IDF works in weighting.

In Fig. 2 after the speech file is processed in NLP, the flow of the TF-IDF calculation itself starts from calculating the frequency of word occurrences (TF) which is similar to what is input by the user. The total of the TF value (df) will be used to calculate the IDF value. From this result, the TF and IDF values were obtained and then multiplied to get the weight value of each word. Referring to Table II Dialogue Scenario 1 (D1), the design for the chat in the D1 dialogue scenario, that is "I want to die", TF-IDF calculations are carried out to determine the weight of the sentence. The calculation weights are as shown in Table III.

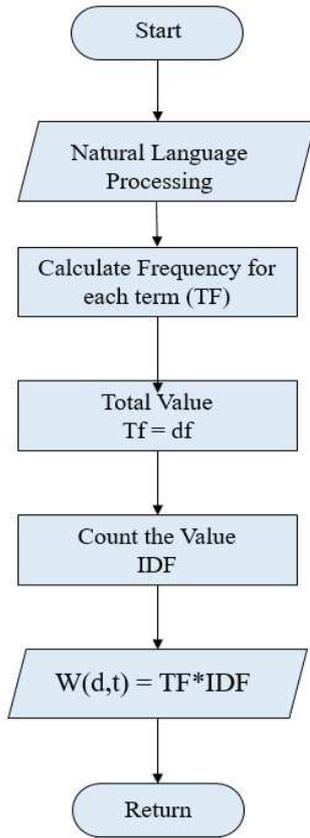


Fig. 2. TF-IDF flow chart.

TABLE III. TF-IDF CALCULATION FOR SCENARIO D1

Q	D1	D2	D3	D4	D5	D6	df	idf
Aku (I)	1	1	1	0	1	1	5	1.079
Mati (Die)	1	0	0	0	0	0	1	1.778

Table III shows the TF and IDF calculations in the D1 dialog scenario, where Q itself is a query or keyword in the dataset document. Meanwhile for df ($df = tf$) itself is the number of words that appear from each dialogue scenario. For the results of the IDF itself, it is obtained from the calculation of the Equation (2), so that the TF and IDF calculations are obtained for each word element, then to get the TF and IDF values, multiplication of the two calculations will be carried out. The following is a calculation table of TF x IDF.

TABLE IV. TF X IDF CALCULATION FOR SCENARIO D1

Q	D1	D2	D3	D4	D5	D6
Aku (I)	1.079	1.079	1.079	0	1.079	1.079
Mati (Die)	1.778	0	0	0	0	0
Total	2.857	1.079	1.079	0	1.079	1.079

From the calculation of the Table IV, it can be seen that the total amount obtained is 2,857. The results of these weights will then be processed in the Finite State Machine method to obtain the most appropriate answer.

D. Finite State Machine

Finite State Machine or FSM is a control system design methodology that describes the behaviour or working principles of the system by using three things, that is state, event, and action. At one point in a significant time, the system will be in one of the active states. The system can switch or transition to another state if it gets certain input or events, either from external devices or components in the system itself. This state transition is generally also accompanied by actions taken by the system when responding to the input that occurs. The actions taken can be in the form of simple actions or involve a series of relatively complex processes [26]. After the weighting process is carried out in the TF-IDF method, then the calculation results that have been obtained will be processed in the FSM method to control the flow of dialogue based on the number of states that have been determined and are limited to the dialogue scenario. The FSM method here is structured by following the dialogue scenario and dialogue session. Figure 3 shows the scenario diagram of dialogue management on FSM.

Figure 3 shows the structure of the expected FSM diagram in accordance with the previously designed dialogue scenario. In this diagram, eight statuses consist of idle, sad, broken up, bullied, angry, family, depression and life. The direction of the arrow pointing to the status itself indicates if the status will remain in that state when there is the same input. From all of these states, there is a trigger that can cause a change from one state to another, this trigger is called a transition. The purpose of this transition change is that it is triggered by a dialog entered by the user. It can be exemplified for the change in transition 1, that is I break up x idle Break Up, where the transition will change from idle to sad status. FSM arranges dialogues based on scenarios that have been designed to be able to interact with its users so that the system is able to respond by issuing answers based on transitions and status.

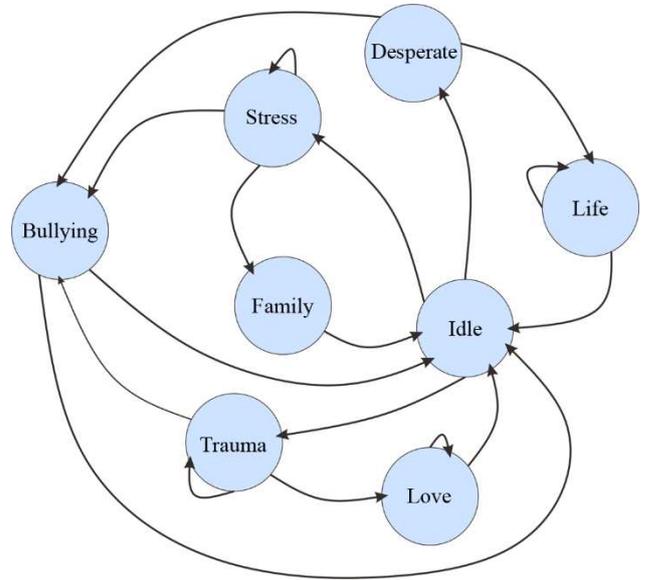


Fig. 3. FSM scenario diagram

IV. ANALYSIS AND RESULT

The test system for speech recognition utilizes the Indonesian Language Google Cloud Speech API technology where this testing process is carried out to obtain an overview of the accuracy of the system translation response. This test is

carried out by four people by saying sentences that have been designed based on the dialogue scenario. The list of people who conducted the testing is shown in Table V.

TABLE V. TEST SAMPLE.

Sample Test	Name	Gender	Age
I	Chandra Ramdhan Purnama	Male	22
II	Irwansyah Sudiarna	Male	57
III	Khanha Shandhika	Male	17
IV	Niar Cuniarsyah	Female	52

Each speaker who became the test data spoke 5 times, for each of the six predefined dialogue scenarios with a short distance between the smartphone and the speaker and in a room with minimal noise. The test results for speech recognition accuracy using Google Cloud Speech are shown in Table VI.

TABLE VI. THE RESULT OF TESTING THE ACCURACY OF THE SYSTEM ANSWER.

Dialogue Scenario	Accuracy (%)				Average Accuracy
	Sample Test I	Sample Test II	Sample Test III	Sample Test IV	
D1	100	100	100	100	100
D2	100	75	100	100	93,75
D3	100	100	100	100	100
D4	100	100	100	100	100
D5	100	100	75	100	93,75
D6	100	100	75	100	93,75
Average					96.5

This research produces an android based application for its users. The display of the Talk to Me application is shown in Figure 4.

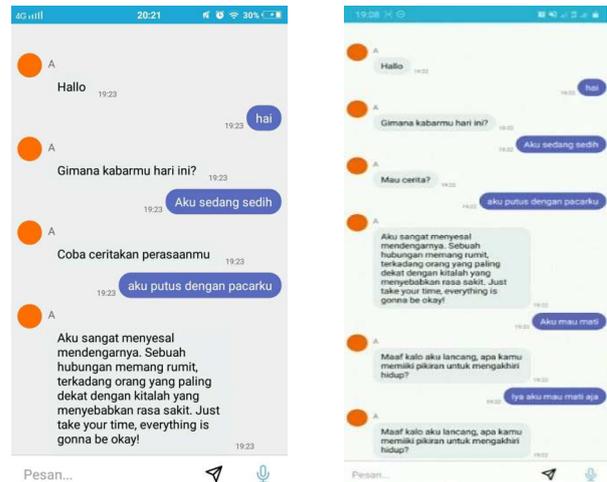
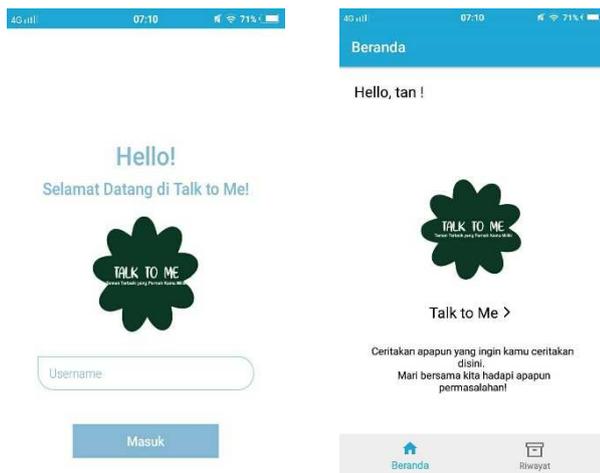


Fig. 4. Application display.

V. CONCLUSION

The Talk to Me application prototype that utilizes Google Cloud Speech API technology to convert speech and text has been successfully implemented so that interaction between users and applications can be carried out easily. The Talk to Me prototype application utilizes Artificial Intelligence technology using the Natural Language Processing method which is used for text processing, the Term Frequency-Inverse Document Frequency method which is used to weight sentences, and the Finite State Machine method which is used to adjust the dialogue flow for interact with users has been designed and implemented successfully. By using this method, the system can understand input from users and can provide the most appropriate answer according to what has been input.

ACKNOWLEDGMENT

The authors express gratitude to the Telkom University for partly funding this research. The authors are also grateful to anonymous reviewers for their valuable comments.

REFERENCES

- [1] B. Sumarsono, 'Depresi adalah Gangguan Mood Sesuai DSM-5', Halo Psikolog, 2020. <https://www.halopsikolog.com/depresi-adalah-gangguan-mood/> (accessed Feb. 01, 2020).
- [2] A. Dirgayunita, 'Depresi: Ciri, Penyebab dan Penanggannya', Journal An-Nafs: Kajian Penelitian Psikologi, vol. 1, no. 1, pp. 1-14, 2016, doi: 10.33367/psi.v1i1.235.
- [3] World Health Organization, 'Depression', World Health Organization, 2020. <https://www.who.int/news-room/fact-sheets/detail/depression> (accessed Feb. 01, 2020).
- [4] K. Kesehatan, 'Hasil Utama RISKESDAS 2018', 2018.
- [5] T. Apriyani, 'Indonesia Darurat Depresi Namun Minim Praktisi', Suara, 2019. <https://yoursay.suara.com/news/2019/12/23/093643/indonesia-darurat-depresi-namun-minim-praktisi>
- [6] A. Rahmadhani, F. Fauziah, and A. Aningsih, 'Sistem Pakar Deteksi Dini Kesehatan Mental Menggunakan Metode Dempster-Shafer', Sisfotnika, vol. 10, no. 1, p. 37, 2020, doi: 10.30700/jst.v10i1.747.
- [7] D. J. Borrell, All About Depression, vol. 25, no. 2. The Mental Health Foundation, 2001. doi: 10.1192/pb.25.2.79.
- [8] R. Alotaibi, A. Ali, H. Alharthi, and R. Almeahmdi, 'AI Chatbot for Tourist Recommendations: A Case Study in the City of Jeddah, Saudi Arabia', Int. J. Interact. Mob. Technol., vol. 14, no. 19, p. 18, Nov. 2020, doi: 10.3991/ijim.v14i19.17201.
- [9] A. Hussain, E. O. C. Mkpjojiogu, and P. C. Okoroafor, 'Assisting Children with Autism Spectrum Disorder with Educational Mobile

- Apps to Acquire Language and Communication Skills: A Review', *Int. J. Interact. Mob. Technol.*, vol. 15, no. 06, p. 161, Mar. 2021, doi: 10.3991/ijim.v15i06.20621.
- [10] ROKOM, 'Cegah Depresi: Yuk, Curhat!', Biro Komunikasi dan Pelayanan Masyarakat, Kementerian Kesehatan RI, 2017. <http://sehatnegeriku.kemkes.go.id/baca/rilis-media/20170406/3620396/cegah-depresi-yuk-curhat/> (accessed Feb. 01, 2020).
- [11] A. P. Nurabsharina et al., 'Aplikasi Sistem Pakar Diagnosis Tingkat Depresi', vol. 25, no. 1, pp. 76–85, 2020.
- [12] A. G. Siregar, P. Studi, T. Informatika, and S. Pakar, 'Sistem Pakar Menentukan Tingkat Depresi Pekerja Yang di PHK Menggunakan Metode Certainly Factor', *Jurnal Riset Komputer (JURIKOM)*, vol. 6, no. 1, pp. 61–69, 2019.
- [13] D. E. Kusumandari, H. Fakhrrurroja, A. Turnip, S. S. Hutagalung, B. Kumbara, and J. Simarmata, 'Removal of EOG artifacts: Comparison of ICA algorithm from recording EEG', in 2014 2nd International Conference on Technology, Informatics, Management, Engineering & Environment, Bandung, Indonesia, Aug. 2014, pp. 335–339. doi: 10.1109/TIME-E.2014.7011642.
- [14] I. Akil, 'Analisa Efektifitas Metode Forward Chaining Dan Backward Chaining Pada Sistem Pakar', *Jurnal Pilar Nusa Mandiri*, vol. 13, no. 1, pp. 35–42, 2017.
- [15] W. Y. Yulianti, Liza Trisnawati, and Theresia Manullang, 'Sistem Pakar Dengan Metode Certainty Factor Dalam Penentuan Gaya Belajar Anak Usia Remaja', *Digital Zone: Jurnal Teknologi Informasi dan Komunikasi*, vol. 10, no. 2, pp. 120–130, 2019, doi: 10.31849/digitalzone.v10i2.2781.
- [16] Andra Arivianda, 'Fenomena Bunuh Diri Mahasiswa', ekspresionline, 2019. <https://ekspresionline.com/fenomena-bunuh-diri-mahasiswa/> (accessed Nov. 25, 2020).
- [17] R. A. Sina et al., 'Penerapan Metode Multi Factor Evaluation Process Pada Aplikasi Sistem Pendukung Keputusan', *J-Icon*, vol. 6, no. 2, pp. 35–39, 2018.
- [18] M. Irfan, L. P. Ayuningtias, and J. Jumadi, 'Analisa Perbandingan Logic Fuzzy Metode Tsukamoto, Sugeno, Dan Mamdani (Studi Kasus : Prediksi Jumlah Pendaftar Mahasiswa Baru Fakultas Sains Dan Teknologi Uin Sunan Gunung Djati Bandung)', *Jurnal Teknik Informatika*, vol. 10, no. 1, pp. 9–16, 2018, doi: 10.15408/jti.v10i1.6810.
- [19] M.H. Tambunan, Martin, H. Fakhrrurroja, Riyanto, and C. Machbub, 'Indonesian speech recognition grammar using Kinect 2.0 for controlling humanoid robot', 2018 International Conference on Signals and Systems (ICSigSys), 2018, doi: 10.1109/ICSIGSYS.2018.8373568.
- [20] H. Fakhrrurroja, Riyanto, A. Purwarianti, A. S. Prihatmanto, and C. Machbub, 'Integration of Indonesian Speech and Hand Gesture Recognition for Controlling Humanoid Robot', 2018 15th International Conference on Control, Automation, Robotics and Vision, ICARCV 2018, pp. 1590–1595, 2018, doi: 10.1109/ICARCV.2018.8581071.
- [21] L. Patrick and D. Suendermann-Oeftl, 'Tuning Sphinx To Outperform Google's Speech Recognition API', *Mechanical Engineering*, pp. 1–6, 2014.
- [22] F. Gozali and R. S. Suharto, 'Pemanfaatan Fitur Google Voice Recognition Pada Smartphone Untuk Pengendalian Peralatan Rumah Tangga', *JETri Jurnal Ilmiah Teknik Elektro*, vol. 16, no. 2, p. 165, 2019, doi: 10.25105/jetri.v16i2.3620.
- [23] Elizabeth D. Liddy, 'Natural Language Processing', *Communications of the ACM*, vol. 39, no. 1, pp. 60–62, 2001, doi: 10.1145/234173.234180.
- [24] H. Fakhrrurroja, C. Machbub, A. S. Prihatmanto, and A. Purwarianti, 'Multimodal interaction system for home appliances control', *International Journal of Interactive Mobile Technologies*, vol. 14, no. 15, pp. 44–67, 2020, doi: 10.3991/IJIM.V14I15.13563.
- [25] S. Qaiser, N. Yusoff, F. Kabir Ahmad, and R. Ali, 'Sentiment Analysis of Impact of Technology on Employment from Text on Twitter', *Int. J. Interact. Mob. Technol.*, vol. 14, no. 07, p. 88, May 2020, doi: 10.3991/ijim.v14i07.10600.
- [26] M. F. Rahadian, A. Suyatno, and S. Maharani, 'Penerapan Metode Finite State Machine Pada Game "The Relationship"', *Informatika Mulawarman : Jurnal Ilmiah Ilmu Komputer*, vol. 11, no. 1, p. 14, 2016, doi: 10.30872/jim.v11i1.198.

[New Submission](#) [Submission 75](#) [ICISS 2022](#) [Conference](#) [News](#) [EasyChair](#)

ICISS 2022 Submission 75

[Update information](#)[Update authors](#)[Update file](#)[Withdraw](#)

If you want to **change any information** about your paper, use links in the upper right corner.

For all questions related to processing your submission you should contact the conference organizers.

[Click here to see information about this conference.](#)

All **reviews sent to you** can be found at the bottom of this page.

Submission 75

Title	Talk to Me: Artificial Intelligence "Virtual Friend" for Depression Sufferers Using Term Frequency – Inverse Document Frequency (TF-IDF) and Finite State Machine Method
Paper:	 (Jun 26, 18:13 GMT) (previous versions)
Author keywords	Depression Artificial Intelligence NLP TF-IDF FSM
Abstract	Depression refers to mental health in which a person experiences a bad mood and has a decreased quality of life. In Indonesia, there are quite a lot of challenges in dealing with depression problems such as lack of education on how to treat de-pression, lack of mental health personnel, and the emergence of a bad stigma against depression sufferers. Voice-based artificial intelligence technology for people with depression was developed to play a role in filling the gap by acting as a support system. In this research, the Natural Language Processing (NLP) method is used to enable computer to be able to understand the user's input. TF-IDF (The Term Frequency-Inverse Document Frequency) method is also used to weight documents and the Finite State Machine (FSM) method used to classify the results of document weighting against a predetermined dialogue scenario. To be able to interact with the system, the author uses the Google Cloud Speech API technology to convert speech and text. As for testing of this system, it is done by calculating the level of accuracy of the answers given by the system to users. The level of accuracy of the system answers obtained from the test results is 96.5%. The accuracy value indicates that the answer given by the system is in accordance with what the user's input.
Submitted	May 21, 17:01 GMT
Last update	May 21, 17:01 GMT

Authors

first name	last name	email	country	affiliation	Web page	corresponding?
Hanif	Fakhrurroja	haniff@telkomuniversity.ac.id	Indonesia	Telkom University	https://telkomuniversity.ac.id/	✓
Tanrida	Utari	161014042@fellow.lpkia.ac.id	Indonesia	School of Management Informatics & Computer LPKIA	https://lpkia.ac.id/	
Andy	Victor	abang@lpkia.ac.id	Indonesia	School of Management Informatics & Computer LPKIA	https://lpkia.ac.id/	
Oka	Mahendra	oka.mahendra@brin.go.id	Indonesia	National Research and	https://brin.go.id/	

				Innovation Agency		
--	--	--	--	----------------------	--	--

Reviews

Review 1

<i>Overall evaluation</i>	2: (accept) Check the sentences (per-son, proto-type, pro-cess) References: Use ICISS Paper Template Wrong citation (Nurabsharina et al (2020), Siregar et al (2019)): Use ICISS Paper Template
---------------------------	---

Review 2

<i>Overall evaluation</i>	2: (accept) Please check the grammar, I suggest you use Grammarly for free.
---------------------------	---



Copyright © 2002 – 2022 EasyChair



ICISS 2022

The 9th International Conference on ICT for Smart Society (ICISS) 2022

Hybrid Conference, 10-11 August 2022

Website: iciss.goesmart.id

Email: iciss2022@scic.itb.ac.id

Date: July 8th 2022

Letter of Acceptance for Papers

Dear Authors : Hanif Fakhurroja, Tanrida Utari, Andy Victor and Oka Mahendra

Id : 75

We are pleased to inform you that your paper , entitled:

Talk to Me: Artificial Intelligence “Virtual Friend” for Depression Sufferers Using Term Frequency – Inverse Document Frequency (TF-IDF) and Finite State Machine Method

has been reviewed and accepted to be presented at ICISS 2022 conference to be held on 10-11 August 2022, offline from Bandung and online via Zoom Meetings (**Hybrid Conference**)

Please submit your full paper and make the payment for registration fee before the deadlines, visit our website for further information

Thankyou

Best Regards,

Dr. Fadhil Hidayat, S.T., M.T.

Organizing Committee

2022 International Conference on ICT for Smart Society (ICISS) took place August 10-11, 2022 in virtual, Indonesia.

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org.

All rights reserved. Copyright ©2022 by IEEE.

IEEE Catalog Number CFP2213V-ART ISBN 978-1-6654-7135-0

ieeexplore.ieee.org/document/9915089

IEEE.org | IEEE Xplore | IEEE SA | IEEE Spectrum | More Sites

Subscribe | Donate | Cart | Create Account | Personal Sign In

IEEE Xplore® Browse ▾ My Settings ▾ Help ▾ Institutional Sign In

All [Search] ADVANCED SEARCH

Conferences > 2022 International Conference...

Talk to Me: Artificial Intelligence “Virtual Friend” for Depression Sufferers Using Term Frequency-Inverse Document Frequency (TF-IDF) and Finite State Machine Method

Publisher: IEEE [Cite This] [PDF]

Hanif Fakhurroja; Tanrida Utari; Andy Victor; Oka Mahendra All Authors

122 Full

https://ieeexplore.ieee.org/Xplore/home.jsp

Need Full-Text access to IEEE Xplore for your organization? CONTACT IEEE TO SUBSCRIBE >

More Like This Analyzing Textual Data Feedback

DOI: [10.1109/ICISS55894.2022.9915089](https://doi.org/10.1109/ICISS55894.2022.9915089)

<https://ieeexplore.ieee.org/document/9915089>

- Abstract**
- Document Sections
- I. Introduction
- II. Related Works
- III. Proposed Method
- IV. Analysis and Result
- V. Conclusion
- Authors**
- Figures
- References
- Keywords

Abstract: Depression refers to mental health in which a person experiences a bad mood and has a decreased quality of life. In Indonesia, there are quite a lot of challenges in dealing with depression problems such as lack of education on how to treat depression, lack of mental health personnel, and the emergence of a bad stigma against depression sufferers. Voice-based artificial intelligence technology for people with depression was developed to play a role in filling the gap by acting as a support system. In this research, the Natural Language Processing (NLP) method is used to enable computer to be able to understand the user's input. TF-IDF (The Term Frequency-Inverse Document Frequency) method is also used to weight documents and the Finite State Machine (FSM) method used to classify the results of document weighting against a predetermined dialogue scenario. To be able to interact with the system, the author uses the Google Cloud Speech API technology to convert speech and text. As for testing of this system, it is done by calculating the level of accuracy of the answers given by the system to users. The level of accuracy of the system answers obtained from the test results is 96.5%. The accuracy value indicates that the answer given by the system is in accordance with what the user's input.

Published in: 2022 International Conference on ICT for Smart Society (ICISS)

Date of Conference: 10-11 August 2022 **DOI:** 10.1109/ICISS55894.2022.9915089

Language Processing for Depression and Anxiety
2023 10th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON)
Published: 2023

Memristor-Based Cellular Automata for Natural Language Processing
2023 30th IEEE International Conference on Electronics, Circuits and Systems (ICECS)
Published: 2023

[Show More](#)

Feedback

Date of Conference: 10-11 August 2022 **DOI:** 10.1109/ICISS55894.2022.9915089

Date Added to IEEE Xplore: 19 October 2022 **Publisher:** IEEE

ISBN Information: **Conference Location:** Bandung, Indonesia

I. Introduction
Depression is a mental health disorder related to mood. A person who is depressed will feel unmotivated, hopeless, and lose interest in activities [1]. Some people think that depression is a trivial thing and will go away by itself, but the fact is that depression is a form of disorder that is more than just a temporary emotional change [2]. According to the World Health Organization, there are more than 264 million people in the world suffering from depression, and many choose to end their lives because of their depression. The effects of depression itself can last for a long time and repeat itself, which will result in a decrease in the function of one's body. The causes of depression include the complex interactions between biological factors, social, and psychological. Unattended depression will lead to sufferers' suicidal

Authors

Hanif Fakhrrorja
Faculty of Industrial Engineering, Telkom University, National Research and Innovation Agency, Bandung, West Java, Indonesia

Tanrida Utari

Feedback

School of Management Informatics & Computer LPKIA, Bandung, West Java, Indonesia

[Andy Victor](#)

School of Management Informatics & Computer LPKIA, Bandung, West Java, Indonesia

[Oka Mahendra](#)

Research Organization for Electronics & Informatics National Research and Innovation Agency, Bandung, West Java, Indonesia

Figures ▼

References ▼

Keywords ▼

Metrics ▼

IEEE Personal Account

 [CHANGE USERNAME/PASSWORD](#)

Purchase Details

[PAYMENT OPTIONS](#)
[VIEW PURCHASED DOCUMENTS](#)

Profile Information

[COMMUNICATIONS PREFERENCES](#)
[PROFESSION AND EDUCATION](#)

Need Help?

US & CANADA: +1 800 678 4333
WORLDWIDE: +1 732 981 0060

Follow

     [Feedback](#)

[EN] Tanrida Utari - Talk to Me

Paper rev

by Hanif Fakhurroja

Submission date: 28-Nov-2020 12:32PM (UTC+0700)

Submission ID: 1458516486

File name: EN_Tanrida_Utari_-_Talk_to_Me_Paper_rev.doc (747.5K)

Word count: 4177

Character count: 22171

Talk to Me: Artificial Intelligence “Virtual Friend” For Depression Sufferers
Using ¹⁹Term Frequency – Inverse Document Frequency (TF-IDF)
and ¹⁶Finite State Machine Method

¹Hanif Fakhurroja, ²Tanrida Utari, ²Andy Victor & ¹Oka Mahendra

¹⁶*Technical Implementation Unit for Instrumentation Development, Indonesian Institute of
Science, Indonesia*

²*Technical Information Department, STMIK LPKIA, Indonesia*

hani002@lipi.go.id; 161014042@fellow.lpkia.ac.id; abang@lpkia.ac.id; okam001@lipi.go.id

ABSTRACT

Depression refers to mental health in which a person experiences a bad mood and has a decreased quality of life. In Indonesia, there are quite a lot of challenges in dealing with depression problems such as lack of education on how to treat depression, lack of mental health personnel, and the emergence of a bad stigma against depression sufferers. Voice-based artificial intelligence technology for people with depression was developed to play a role in filling the gap by acting as a support system. In this research, the Natural Language Processing (NLP) method is used to enable computer to be able to understand the user’s input. The ⁵Term Frequency - Inverse Document Frequency (TF-IDF) method is also used to weight documents and the Finite State Machine (FSM) method used to classify the results of document weighting against a predetermined dialogue scenario. To be able to interact with the system, the author uses the Google Cloud Speech API technology to convert speech and text. As for testing of this system, it is done by calculating the level of accuracy of the answers given by the system to users. The level of accuracy of the system answers obtained from the test results is 96.5%. The accuracy value indicates that the answer given by the system is in accordance with what the user’s input.

Keywords: Depression, Artificial Intelligence, NLP, TF-IDF, FSM.

INTRODUCTION

Depression is a mental health disorder related to mood. A person who is depressed will feel unmotivated, hopeless, and lose interest in activities (Sumarsono, 2020). Some people think that depression is a trivial thing and will go away by itself, but the fact is that depression is a form of disorder that is more than just a temporary emotional change (Dirgayunita, 2016).¹⁰ According to the World Health Organization, there are more than 264 million people in the world suffering from depression, and nearly 800,000 people each year choose to end their lives because of their depression. The effects of depression itself can last for a long time and repeat itself, which will result in a decrease in the function of one's body. The⁹ causes of depression include the complex interactions between social, psychological, and biological factors. Unattended depression will lead to sufferers suicidal thoughts. In 2015, suicide was ranked number two in the cause of death for a person aged 15-29 years (World Health Organization, 2020).

⁷ In Indonesia, based on the results of the Basic Health Research of the Ministry of Health in 2018, the prevalence rate of depression for the age group ≥ 15 years is 6.1%. According to that, only 9% of people with depression undergo medical treatment (Kesehatan, 2018). There are many challenges in dealing with depression, such as the stigma for people with depression being labeled abnormal and often associated with mystical things. Moreover, the health services provided ranging from facilities to practitioners are not yet qualified. Indonesia only has 773 psychiatrists and 451 clinical psychologists centered on the island of Java, a very small number when compared to Indonesia's population of approximately 260 million people. This means that 1 (one) trained psychiatrist must handle 300,000-400,000 people. WHO determines that¹⁸ the ratio of the number of psychologists and psychiatrists to the total population should be 1 per 30 thousand people. That means, Indonesia still lacks around 24,000 mental practitioners (Apriyani, 2019). Time and cost limitations are also an obstacle for depression sufferers to get help from psychologists (Rahmadhani et al., 2020).

Anyone can experience depression. In fact, everyone has a different pattern of depression. For example, some people experience major depression for a short time, but some people experience mild depression for a very long time (Borrill, 2001). Therefore, based on the background provided, the

15
authors are interested in developing an artificial intelligence technology in Bahasa using the Natural Language Processing method, Term Frequency-Inverse Document Frequency (TF-IDF), and Finite State Machine where these methods focus on natural language processing and answer classification so that later it allows the computer to be able to understand the language entered by the user and be able to provide answers in accordance with what the user inputs. For the development of the system itself, the author adds a voice-based conversation mode so that when used, users can more easily tell what they are thinking and feeling.

RELATED WORKS

The rapid development of technology has succeeded in encouraging humans to create many things to facilitate their work, including in the field of mental health. In fact, everyone always tells about what they feel when they get happiness or face sadness in their immediate environment (ROKOM, 2017). In the case of depression, at least the sufferer needs someone to listen to all the complaints they have. However, based on the background that has been described there are many challenges in meeting these needs. Along with the times, nowadays many technologies have been developed for human mental health. For the example, Expert System Application for Diagnosis of Levels of Depression in Teenage based on Android (Nurabsharina et al., 2020). This study is conducted to assist psychologists in making treatment decisions for depressed patients. The expert system application developed focuses on early detection of the level of depression that occurs in a person. As for the depression category, researchers used four levels, that is Mood Disorders, Mild Depression, Moderate Depression, and Major Depression. The application developed consists of several stages, one of which is the Forward Chaining method. The Forward Chaining method itself is one of the main methods of reasoning in using an inference engine (decision making machine) and can logically be described as a repetition application of the modus ponens (a set of inference rules and valid arguments) (Akil, 2017). In general, this expert system application works by receiving input in the form of symptoms of depression experienced by users. Then the system will process the data and produce output in the form of depression levels and a large percentage of depressive symptoms using

the Forward Chaining method. The results of the study using 15 sample data. It was found that the level of accuracy resulting from the application of this method was 93%, where these results prove that the application of Forward Chaining method for expert system applications is very accurate.

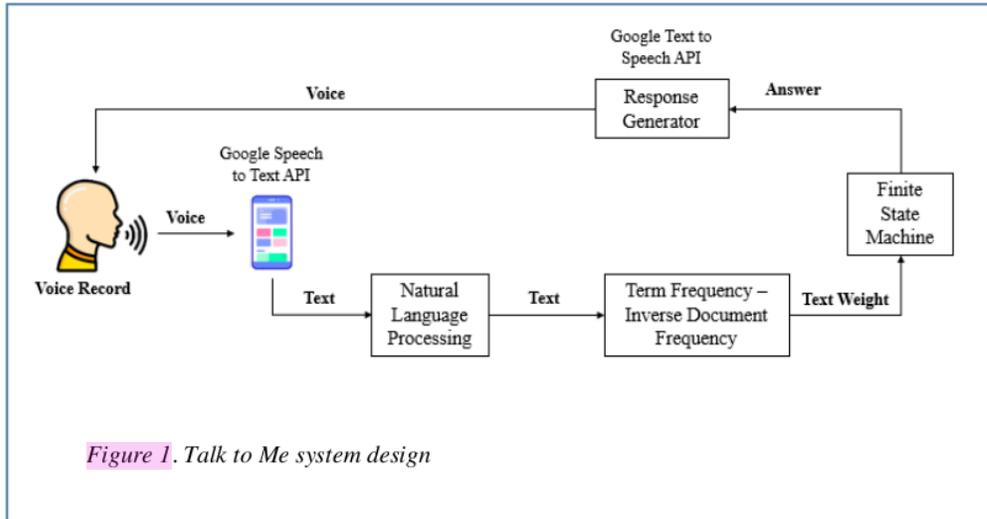
Expert System Determines Depression Levels of Layed Workers Using Certainly Factor Method (Siregar et al., 2019). Termination of employment by companies is a frightening specter for employees. The emergence of various emotions when experiencing layoffs will certainly affect a person's mental health greatly. A person who is laid off can experience various changes that are in stark contrast, such as deep sadness, disappointment, hopelessness, and even separation from his social life. This study develops an expert system application that can detect the level of depression in laid-off workers by using the Certainly Factor method. Meanwhile, the Certainly Factor method is a clinical parameter value given by MYCIN to show the amount of trust (Yulianti et al., 2019). In the case study, the level of depression used was divided into three parts, namely Mild Depression, Moderate Depression, and Major Depression. From the results of testing conducted on case studies of workers A, B, and C, it was found that the percentage of depression suffered by worker A was 29%, worker B was 44%, and worker C was 47%.

Expert System to Determine Student Anxiety Levels in Writing Thesis Using the Multi Factor Evaluation Process and Tsukamoto Fuzzy Inference Method (Ismunu et al., 2020). In Indonesia, writing a thesis is an absolute requirement for bachelor students to obtain a Bachelor's degree. For final semester students, the frustration of working on their thesis always appears. The frustration when working on this thesis can cause symptoms of depression (Andra Arivianda, 2019). This research was made to develop a prototype expert system to detect the level of anxiety in final year students who are compiling their thesis. This research uses the ² Multi Factor Evaluation Process (MFEP) and Fuzzy Tsukamoto Inference method. According to Render B and Stair, the ² MFEP is a quantitative method that uses a weighting system. In multi-factor decision making, decision makers subjectively and intuitively weigh various factors or criteria that have an important influence on the alternative choices (Sina et al., 2018). Meanwhile, fuzzy logic is used to translate a quantity that is expressed using language. During the rule evaluation process in the inference engine, the Fuzzy Tsukamoto method

uses the MIN implication function to get the α -predicate value for each rule (Irfan et al., 2018). The results of the study using 52 test data, both system prototypes and experts have results that 42 data (81%) are suitable and 10 data (19%) are not suitable. The system prototype designed by implementing the MFEP method and Fuzzy Tsukamoto Inference can be used to assist in determining the level of student anxiety in compiling a thesis with a success rate of 81%.

PROPOSED METHOD

The dialogue management system design architecture used in this study can be seen in the figure below.



In this study, the authors designed a dialogue management system with six dialogue scenarios based on three categories of speech. The following are the dialog categories that have been designed.

Table 1.

Dialogue scenario.

Categories	Dialogue Classification	Keyword of Dialogue Scenario
Putus Asa	D1 Kehidupan	<i>Aku ingin mati</i>
	D1 Life	I want to die
Desperate	D2 Bullying	<i>Aku dibully</i> I am being bullied
	D3 Bullying	<i>Aku diperlakukan tidak baik</i> I was mistreated
Stress	D4 Keluarga	<i>Keluargaku hancur</i>

	D4 Family	My family is broken
	D5 Percintaan	Aku putus dengan pacarku
Trauma	D5 Love	I broke up with my boyfriend/girlfriend
	D6 Bullying	Aku dihina I was insulted

The dialog scenario above will then be described in a dialogue session between application users and the Talk to Me system. The following is an example of a dialogue session for the Despair category, the D1 Life dialog classification that has been created for app users to chat with the Talk to Me system.

Table 2.

Dialogue Scenario 1 (D1).

Dialogue Scenario 1 (D1)	
User	: <i>Aku merasa putus asa</i> I feel desparate
Talk to Me	: <i>Apakah kamu mau cerita?</i> Do you want to talk about it?
User	: <i>Aku cape dengan hidup ini</i> I am tired of this life
Talk to Me	: <i>Ada banyak alasan yang bikin kita cape. Apa kamu sering merasa seperti ini?</i> There are so many reasons to feel tired. Do you always feel like this?
User	: <i>Aku merasa seperti ini jika aku sedang sendirian</i> I feel like this when I am alone
Talk to Me	: <i>Aku ada disini untukmu, jangan pernah merasa sendirian</i> I am here for you, do not feel that you are alone
User	: <i>Aku ingin mati saja</i> I want to die

Talk to Me : *Apakah kamu berpikir untuk mengakhiri hidup?*

Are you thinking to end your life?

User : *Ya*

Yes

Talk to Me : *Aku tidak bisa membayangkan betapa menyakitkannya perasaan itu, tapi aku ingin mencoba untuk memahami situasimu ²⁵ saat ini. Tidak ada yang lebih penting selain apa yang kamu rasakan. Jangan pernah menyerah, aku yakin banyak sekali orang yang peduli terhadapmu. Kami tidak ingin kehilangan seseorang yang berharga seperti dirimu. Mari kita berjuang untuk menghadapi semua ini.*

I can't imagine how painful that feeling is, but I want to try to understand your current situation. Nothing is more important than how you feel. Don't ever give up, I'm sure a lot of people care about you. We don't want to lose someone as precious as you. Let's fight for all of this.

Speech Recognition using Google Cloud Speech API

²⁴ Speech Recognition is the process of converting a digital signal that converts ¹⁷ sound waves into a set of numbers which are then matched with a pattern stored on a device (Arifin et al., 2016). The system designed in this study is a dialogue management system using the Indonesian language for human interaction with voice-based applications so that speech recognition ¹¹ uses the Google Cloud Speech API. The author chooses to ¹¹ use the Google Cloud Speech API because it can be accessed for free for the cloud-based speech recognizer (Patrick & Suendermann-Oeft1, 2014). In addition, the Google Cloud Speech API itself has experienced rapid development by having 120 language options including Indonesian. ²³ The main purpose of this voice recognition technology is to enter commands in the form of a voice into the machine so that the machine is able to understand and process it directly (Gozali & Suharto, ¹⁴ 2019).

Natural Language Processing (NLP)

Natural Language Processing is a computational technique used to analyze and represent text written naturally (human language) at one or more levels of linguistic analysis with to obtain human-like language processing that can be implemented in various fields (Elizabeth D. Liddy, 2001). The series of processes of NLP used in this study include case folding, tokenizing, filtering, and stemming. Case folding is used to change all uppercase letters in sentences to lowercase letters, tokenizing is used to break sentences into pieces of words, filtering is used to carry out the retrieval or filtering steps for words that are important in sentence, and the last is stemming, which is making changes to the whole sentence to become a root word by removing the affix from each document. Stemming in Indonesian itself has a more complex structure than stemming in English (Fakhrurroja et al., 2020). After all the series of processes have been completed, the data will be processed by TF-IDF.

6 Term Frequency – Inverse Document Frequency (TF-IDF)

Term Frequency-Inverse Document Frequency, abbreviated as TF-IDF, is a statistical calculation method intended to indicate how important a word is to a document in a corpus or database. This method is often used as a weighting factor for information retrieval and text mining. This method serves to give weight to each word that appears and calculate the inverse of the existing sentence frequency. The results of the assessment depend on whether the question term is present or not in the dialogue sentence document zone. It lies in the sentence in the data set that contains more terms in the question and is related to the question, therefore the sentence has a higher score. For tf is a local parameter that calculates the frequency of each term t in the sentence document d , so that tf, d means the frequency of occurrence of the terms t to i in sentences d to j (PERMATASARI, 2019).

$$tf(t_i, d_j) = f_{i,d} \quad (1)$$

The global parameter that is idf is the inverse frequency of the sentence, idf calculates the inverse of the occurrence of the term in the dialog dataset, where D is a set of sentences in the dialogue scenario.

$$idf(t_i, D) = 1 + \log \frac{D}{d(t_i)} \quad (2)$$

Therefore, the TF-IDF equation is used to give the weight of the sentence document d into term t .

$$w(t_i, d_j) = \overset{21}{tf(t_i, d_j)} * idf(t_i, D) \quad (3)$$

The frequency for this term is used to improve memory in search of information but cannot be ascertained to increase precision. Words with a high TF-IDF value imply a strong relationship with the dialogue that appears.

The design of the TF-IDF method is used as a method for giving weight to dialogue sentences in the answer dataset in the Talk to Me system. The following is a flow chart of how TF-IDF works in weighting.

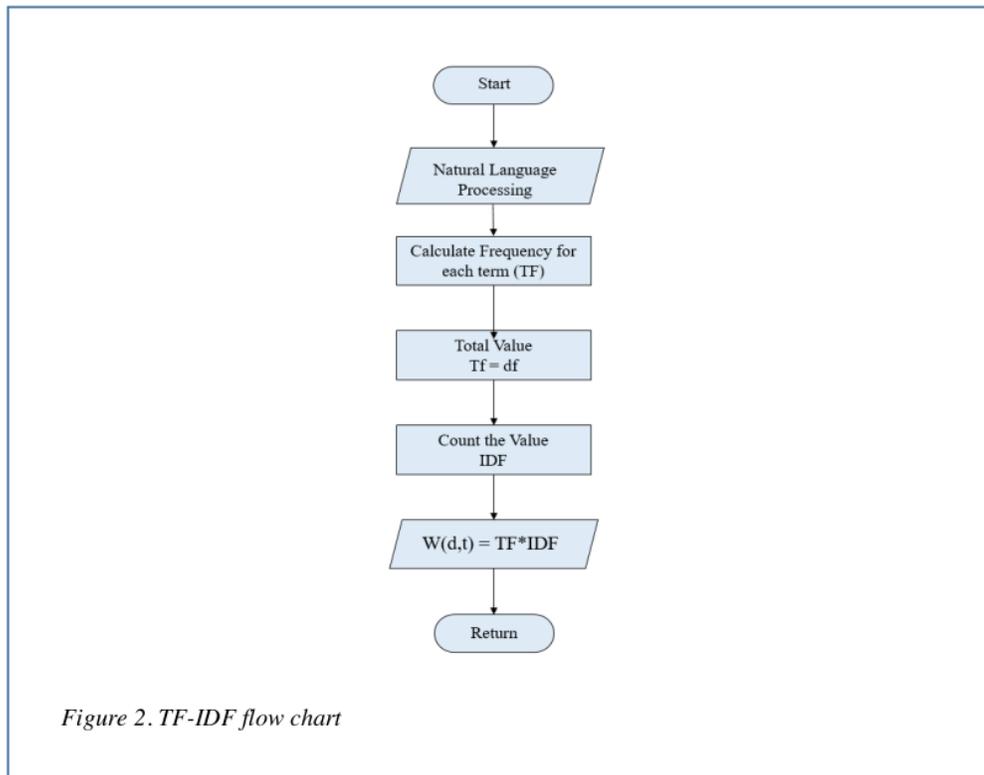


Figure 2. TF-IDF flow chart

In the picture above, after the speech file is processed in NLP, the flow of the TF-IDF calculation itself starts from calculating the frequency of word occurrences (TF) which is similar to what is input by the user. The total of the TF value (df) will be used to calculate the IDF value. From this result, the TF and IDF values were obtained and then multiplied to get the weight value of each word. Referring to Table 2 Dialogue Scenario 1 (D1), the design for the chat in the D1 dialogue scenario, that is "I want to die", TF-IDF calculations are carried out to determine the weight of the sentence. The calculation weights are as follows.

Table 3.

TF-IDF calculation for Scenario D1.

⁸ Q	D1	D2	D3	D4	D5	D6	df	idf
Aku I	1	1	1	0	1	1	5	1.079
Mati Die	1	0	0	0	0	0	1	1.778

The table above shows the TF and IDF calculations in the D1 dialog scenario, where Q itself is a query or keyword in the dataset document. Meanwhile for df (df = tf) itself is the number of words that appear from each dialogue scenario. For the results of the IDF itself, it is obtained from the calculation of the formula in IL2, so that the TF and IDF calculations are obtained for each word element, then to get the TF and IDF values, multiplication of the two calculations will be carried out. The following is a calculation table of TF x IDF.

Table 4.

TF x IDF Calculation for Scenario D1.

⁸ Q	D1	D2	D3	D4	D5	D6
Aku I	1.079	1.079	1.079	0	1.079	1.079
Mati Die	1.778	0	0	0	0	0
Total	2.857	1.079	1.079	0	1.079	1.079

From the calculation of the table above, it can be seen that the total amount obtained is 2,857. The results of these weights will then be processed in the Finite State Machine method to obtain the most appropriate answer.

Finite State Machine

⁴ Finite State Machine or FSM is a control system design methodology that describes the behavior or working principles of the system by using three things, that is state, event, and action. ¹ At one point in a significant time, the system will be in one of the active states. ¹ The system can switch or transition to another state if it gets certain input or events, either from external devices or components in the system itself. This state transition is generally also accompanied by actions taken by the system when responding to the input that occurs. The actions taken can be in the form of simple actions or involve a series of relatively complex processes (Rahadian et al., 2016). After the weighting process is carried out in the TF-IDF method, then the calculation results that have been obtained will be processed in the FSM method to control the flow of dialogue based on the number of states that have been determined and are limited to the dialogue scenario. The FSM method here is structured by following the dialogue scenario and dialogue session. The following is a scenario diagram of a dialogue management on FSM.

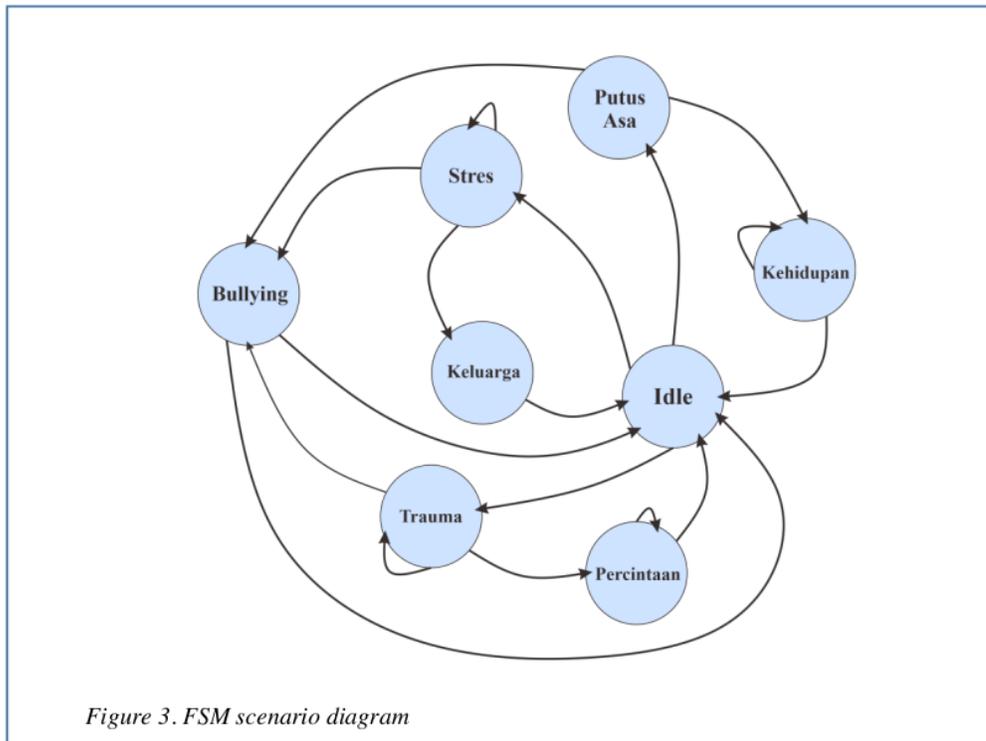


Figure 3. FSM scenario diagram

The picture above shows the structure of the expected FSM diagram in accordance with the previously designed dialogue scenario. In this diagram, eight statuses consist of idle, sad, broken up, bullied, angry, family, depression and life. The direction of the arrow pointing to the status itself indicates if the status will remain in that state when there is the same input. From all of these states, there is a trigger that can cause a change from one state to another, this trigger is called a transition. The purpose of this transition change is that it is triggered by a dialog entered by the user. It can be exemplified for the change in transition 1, that is *I break up x idle* → *Break Up*, where the transition will change from idle to sad status. FSM arranges dialogues based on scenarios that have been designed to be able to interact with its users so that the system is able to respond by issuing answers based on transitions and status.

ANALYSIS AND RESULT

The test system for speech recognition utilizes the Indonesian Language Google Cloud Speech API technology where this testing process is carried out to obtain an overview of the accuracy of the system translation response. This test is carried out by four people by saying sentences that have been designed based on the dialogue scenario. The list of people who conducted the testing is as follows.

Table 5.

Test sample.

Sample Test	Name	Gender	Age
I	Chandra Ramdhan Purnama	Male	22
II	Irwanyah Sudiarna	Male	57
III	Khanha Shandhika	Male	17
IV	Niar Cuniarsyah	Female	52

Each speaker who became the test data spoke 5 times, for each of the six predefined dialogue scenarios with a short distance between the smartphone and the speaker and in a room with minimal noise. The following are the test results for speech recognition accuracy using Google Cloud Speech.

Table 6.

The following is the result of testing the accuracy of the system answer.

Dialogue Scenario	Accuracy (%)				Average Accuracy
	Sample Test	Sample Test	Sample Test	Sample Test	
	1	II	III	IV	
D1	100	100	100	100	100
D2	100	75	100	100	93,75
D3	100	100	100	100	100
D4	100	100	100	100	100
D5	100	100	75	100	93,75
D6	100	100	75	100	93,75
Average					96.5

Application Display

This research produces an android based application for its users. The following is a display of the Talk to Me application.

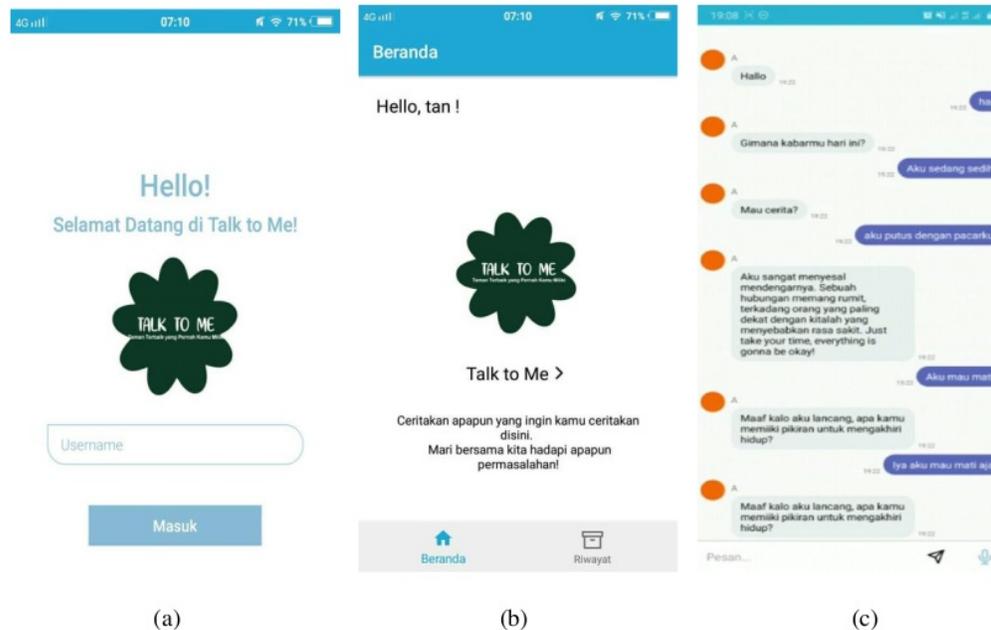


Figure 4. Application display (DIGANTI ENGLISH)

CONCLUSION

The Talk to Me application prototype that utilizes Google Cloud Speech API technology to convert speech and text has been successfully implemented so that interaction between users and applications can be carried out easily. The Talk to Me prototype application utilizes Artificial Intelligence technology using the Natural Language Processing method which is used for text processing, the **5** Term Frequency - Inverse Document Frequency method which is used to weight sentences, and the Finite State Machine method which is used to adjust the dialogue flow for interact with users has been designed and implemented successfully. By using this method, the system can understand input from users and can provide the most appropriate answer according to what has been input.

REFERENCES

- Akil, I. (2017). ANALISA EFEKTIFITAS METODE FORWARD CHAINING DAN BACKWARD CHAINING PADA SISTEM PAKAR. *Jurnal Pilar Nusa Mandiri*, 13(1), 35–42.
- Andra Arivianda. (2019). *Fenomena Bunuh Diri Mahasiswa*. Ekspresionline. <https://ekspresionline.com/fenomena-bunuh-diri-mahasiswa/>
- Apriyani, T. (2019). *Indonesia Darurat Depresi Namun Minim Praktisi*. Suara.
- Arifin, F., Marisa, F., & Wijaya, I. D. (2016). Implementasi Google Speech Untuk Penentuan Level Pembelajaran Iqro' Berbasis Android. *JOINTECS (Journal of Information Technology and Computer Science)*, 1(1), 16–21. <https://doi.org/10.31328/jointecs.v1i1.403>
- Borrill, D. J. (2001). All About Depression. In *Psychiatric Bulletin* (Vol. 25, Issue 2). The Mental Health Foundation. <https://doi.org/10.1192/pb.25.2.79>
- Dirgayunita, A. (2016). Depresi: Ciri, Penyebab dan Penangannya. *Journal An-Nafs: Kajian Penelitian Psikologi*, 1(1), 1–14. <https://doi.org/10.33367/psi.v1i1.235>
- Elizabeth D. Liddy. (2001). Natural Language Processing. *Communications of the ACM*, 39(1), 60–62. <https://doi.org/10.1145/234173.234180>
- Fakhrurroja, H., Machbub, C., Prihatmanto, A. S., & Purwarianti, A. (2020). Multimodal interaction system for home appliances control. *International Journal of Interactive Mobile Technologies*, 14(15), 44–67. <https://doi.org/10.3991/IJIM.V14I15.13563>
- Gozali, F., & Suharto, R. S. (2019). Pemanfaatan Fitur Google Voice Recognition Pada Smartphone Untuk Pengendalian Peralatan Rumah Tangga. *JETri Jurnal Ilmiah Teknik Elektro*, 16(2), 165. <https://doi.org/10.25105/jetri.v16i2.3620>
- Irfan, M., Ayuningtias, L. P., & Jumadi, J. (2018). Analisa Perbandingan Logic Fuzzy Metode Tsukamoto, Sugeno, Dan Mamdani (Studi Kasus : Prediksi Jumlah Pendaftar Mahasiswa Baru Fakultas Sains Dan Teknologi Uin Sunan Gunung Djati Bandung). *Jurnal Teknik Informatika*, 10(1), 9–16. <https://doi.org/10.15408/jti.v10i1.6810>

- Ismunu, R. S., Purnomo, A. S., Yunita, R., & Subardjo, S. (2020). *Dalam Menyusun Skripsi Menggunakan Metode Multi Factor*. 978–979.
- Kesehatan, K. (2018). *HASIL UTAMA RISKESDAS 2018*.
- Nurabsharina, A. P., Kosasih, R., Teknologi, F., Universitas, I., Studi, P., Matematika, K., Gunadarma, U., & Barat, J. (2020). *Aplikasi Sistem Pakar Diagnosis Tingkat Depresi*. 25(1), 76–85.
- Patrick, L., & Suendermann-Oeft1, D. (2014). TUNING SPHINX TO OUTPERFORM GOOGLE'S SPEECH RECOGNITION API. *Mechanical Engineering*, 1–6.
- PERMATASARI, D. A. (2019). *SISTEM MANAJEMEN DIALOG MANUSIA DAN ROBOT DENGAN METODE TF-IDF KEMIRIPAN KOSINUS DAN KOEFISIEN JACCARD* (Vol. 23216303). Institut Teknologi Bandung.
- Rahadian, M. F., Suyatno, A., & Maharani, S. (2016). Penerapan Metode Finite State Machine Pada Game “The Relationship.” *Informatika Mulawarman : Jurnal Ilmiah Ilmu Komputer*, 11(1), 14. <https://doi.org/10.30872/jim.v11i1.198>
- Rahmadhani, A., Fauziah, F., & Aningsih, A. (2020). Sistem Pakar Deteksi Dini Kesehatan Mental Menggunakan Metode Dempster-Shafer. *Sisfotenika*, 10(1), 37. <https://doi.org/10.30700/jst.v10i1.747>
- ROKOM. (2017). *Cegah Depresi: Yuk, Curhat!* Biro Komunikasi Dan Pelayanan Masyarakat, Kementerian Kesehatan RI. <http://sehatnegeriku.kemkes.go.id/baca/rilis-media/20170406/3620396/cegah-depresi-yuk-curhat/>
- Sina, R. A., Letelay, K., Sihotang, D. M., Komputer, J. I., Cendana, U. N., Permohonan, P., & Nasabah, P. (2018). Penerapan Metode Multi Factor Evaluation Process Pada Aplikasi Sistem Pendukung Keputusan. *J-Icon*, 6(2), 35–39.
- Siregar, A. G., Studi, P., Informatika, T., & Pakar, S. (2019). Sistem Pakar Menentukan Tingkat Depresi Pekerja Yang di PHK Menggunakan Metode Certainly Factor. *Jurnal Riset Komputer*

(*JURIKOM*), 6(1), 61–69.

Sumarsono, B. (2020). *Depresi adalah Gangguan Mood Sesuai DSM-5*. Halo Psikolog.

<https://www.halopsikolog.com/depresi-adalah-gangguan-mood/>

World Health Organization. (2020). *Depression*. World Health Organization.

<https://www.who.int/news-room/fact-sheets/detail/depression>

Yulianti, W. Y., Liza Trisnawati, & Theresia Manullang. (2019). Sistem Pakar Dengan Metode

Certainty Factor Dalam Penentuan Gaya Belajar Anak Usia Remaja. *Digital Zone: Jurnal*

Teknologi Informasi Dan Komunikasi, 10(2), 120–130.

<https://doi.org/10.31849/digitalzone.v10i2.2781>

[EN] Tanrida Utari - Talk to Me Paper rev

ORIGINALITY REPORT

11%

SIMILARITY INDEX

8%

INTERNET SOURCES

6%

PUBLICATIONS

2%

STUDENT PAPERS

PRIMARY SOURCES

1	jurnal.unai.edu Internet Source	2%
2	Teuku Mufizar, Evi Dewi Sri Mulyani, Restu Adi Wiyono, Wendi Arifiana. "A Combination Of Multi Factor Evaluation Process (MFEP) And The Distance To The Ideal Alternative (DIA) Methods For Majors Selection And Scholarship Recipients In SMAN 2 Tasikmalaya", 2018 6th International Conference on Cyber and IT Service Management (CITSM), 2018 Publication	1%
3	br.123dok.com Internet Source	1%
4	repository.usu.ac.id Internet Source	1%
5	www.hindawi.com Internet Source	1%
6	www.freepatentsonline.com Internet Source	<1%

7	worldwidescience.org Internet Source	<1%
8	id.123dok.com Internet Source	<1%
9	www.wjpps.com Internet Source	<1%
10	www.medicalnewstoday.com Internet Source	<1%
11	Victor Kusumota, Rafael Aroca, Felipe Martins. "An Open Source Framework for Educational Applications Using Cozmo Mobile Robot", 2018 Latin American Robotic Symposium, 2018 Brazilian Symposium on Robotics (SBR) and 2018 Workshop on Robotics in Education (WRE), 2018 Publication	<1%
12	Submitted to essex Student Paper	<1%
13	Eva Y Puspaningrum, Budi Nugroho, Ariyono Setiawan, Nuraini Hariyanti. "Detection of Text Similarity for Indication Plagiarism Using Winnowing Algorithm Based K-gram and Jaccard Coefficient", Journal of Physics: Conference Series, 2020 Publication	<1%

14

education.sakshi.com

Internet Source

<1%

15

jaympatel.com

Internet Source

<1%

16

Hanif Fakhurroja, Muhammad Nashir Atmaja, Joe Nathan C.G Panjaitan, Andry Alamsyah, Aris Munandar. "Crisis Communication on Twitter: A Social Network Analysis of Christchurch Terrorist Attack in 2019", 2019 International Conference on ICT for Smart Society (ICISS), 2019

Publication

<1%

17

W B Zulfikar, U Syaripudin, O T Kurahman, M F Junjuran. "Enhanced shalat and wudhu learning media through speech recognition application", IOP Conference Series: Materials Science and Engineering, 2018

Publication

<1%

18

academic.oup.com

Internet Source

<1%

19

arxiv.org

Internet Source

<1%

20

iconvert.blogspot.com

Internet Source

<1%

21

www.researchgate.net

Internet Source

<1%

22

scholarworks.sjsu.edu

Internet Source

<1%

23

garuda.ristekbrin.go.id

Internet Source

<1%

24

Asif Salekin, Zeya Chen, Mohsin Y. Ahmed, John Lach, Donna Metz, Kayla De La Haye, Brooke Bell, John A. Stankovic. "Distant Emotion Recognition", Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2017

Publication

<1%

25

sgrputu.blogspot.com

Internet Source

<1%

26

Tonni Limbong, Janner Simarmata, Mamed Rofendi Manalu, Alex Rikki, Denni M Rajagukguk. "Implementation Of Multi Factor Evaluation Process (MFEP) In Assessment Of Employee Performance Achievement", Journal of Physics: Conference Series, 2020

Publication

<1%

Exclude quotes On

Exclude matches Off

Exclude bibliography On