Spoof Detection for Automatic Speaker Verification
Second Meeting
Report

I. Organizer:

Name:	Dr. Dessi Puji Lestari
Position:	Professor (lecturer)
Institution:	Institut Teknologi Bandung (Bandung Institute of Technology), Indonesia

II. Program:

Date: 21-22 December 2023

Venue: Zest Hotel Sukajadi

Jl. Sukajadi No.16, Pasteur, Kec. Sukajadi, Kota Bandung, Jawa Barat 40162, Indonesia

Program Agenda:

Dec 21	09:00 - 09:30	Registration
	09:30 - 09:40	Welcome remarks by local host (Prof.Dessi Puji Lesstari)
	09:40 - 09:50	Welcome remarks by Project leader (Dr. Kasorn)
	09:50 - 10.00	Photo session
	10.00 - 10.30	NECTEC's research progress (Dr. Kasorn)
	10:30 - 11.00	NICT's research progress (Dr. Xugang)
	11.00 - 11:30	SIIT's research progress (Miss Khaing Zar Mon)
	11:30 - 12.00	UCSY's research progress (Dr. Win pa pa)
	12:00 - 13:30	Lunch
	13:30 - 14:00	UBD's research progress (Dr. Yasssin)
	14:00 - 14:30	JAIST's research progress (Prof. Unoki)
	14:30 - 15:00	ITB research progress (Prof.Dessi)
	15:00 - 15:30	Review project Sharing (Kasorn)
	15:30 - 16:00	Break
	16:00 - 16:30	Discussion + Q/A
Dec 22	09:30 - 10.00	Travel to Institut Teknologi Bandung
	10.00 - 11:30	Lab visiting in Institut Teknologi Bandung
	11:30 - 11:45	Break
	11:45 - 12:15	Travel back to meeting venue
	12:15 - 13:30	Lunch
	13:30 - 14:00	Research problems caused by work practices. (Group discussion)
	14:00 - 15:00	brainstorm solutions to problems caused by work practices.
	15:00 - 15:15	Break
	15:15 - 16:00	Meeting conclusion

III. Participants:

No.	Name	Organization	Itinerary	Remark
1	Masashi Unoki	JAIST		Online
2	Candy Olivia Mawalim	JAIST	Dec20-Dec23	Onsite Self-supporting
3	Kai Li	JAIST		Online
4	Anuwat Chaiwongyen	JAIST/SIIT		Online
5	Waree Kongprawechnon	SIIT		Online
6	Pakinee Aimmanee	SIIT		Online
7	Khaing Zar Mon	SIIT		Online
8	Ananda Garin Mills	SIIT		Online
9	Pannathorn Sathirasattayanon	SIIT		Online
10	Patthranit Kaewcharuay	SIIT		Online
11	Mr. Nanthayod Termkoh	SIIT		Online
12	Kasorn Galajit	NECTEC	Dec18-Dec23	Onsite
13	Jessada Karnjana	NECTEC	Dec20-Dec23	Onsite
14	Suradej Duangpummet	NECTEC		online
15	Widhyakorn Asdornwised	CU		online
16	Win Pa Pa	UCSY	Dec19-Dec24	Onsite
17	Ms. Aye Mya Hlaing	UCSY	Dec19-Dec24	Onsite
18	Win Lai Lai Phyu	UCSY		Online
19	Myat Aye Aye Aung	UCSY		Online
20	Dr.Hay Mar Soe Naing	UCSY		Online
21	Xugang Lu	NICT		Online
22	Sheng Li	NICT		online
23	Dk Hayati Pg Hj Mohd Yassin	UBD	Dec20-Dec23	Onsite
24	Mr. Navod Neranjan Thilakarathne	UBD		Online
25	Dr. Dessi Puji Lestari	ITB	HOST	Onsite
26	Mr. Kosin Kalarat	SIIT		Online
27	Dr. Sasiporn Usanavain	SIIT		Online
28	Dr. Surasak Boonkla	NECTEC		Online

We have 28 members in total, and 7 participants are onsite.

IV. Summary of the activities corresponding to the objectives.

A. Objective of this event

In order to run project smoothly, the second meeting objectives are as follows.

1. To track the progress of members from each institution.
2. To brainstorm solutions to problems caused by work practices.
3. To follow the output from each institute

B. Activities corresponding to the objective.
The Summary of the objective and its status

Objective	Status
1. To track the progress of members from each institution.	Done
2. To brainstorm solutions to problems caused by work practices.	Done
3. To follow the output from each institute	Done

Activities corresponding to the objective.

1. <u>Objective 1 - To track the progress of members from each institution.</u>
<u>Sub-objective – Update project members.</u>
After the project launched, 5 members were added to this project , that is two members from Myanmar, one member from ITB, one member from SIIT, and one member from NICT. In addition, one member from CU has already retired from his career. However, his membership with the project remains. JAIST also request to add one more member to the project that is Mr. Klalid ZAMAN.

Sub-objective – Update the project status

The project leader summarized the scope of the project to members and on-going activities. She presented the project detail, updated the status and expected output f to the audience.

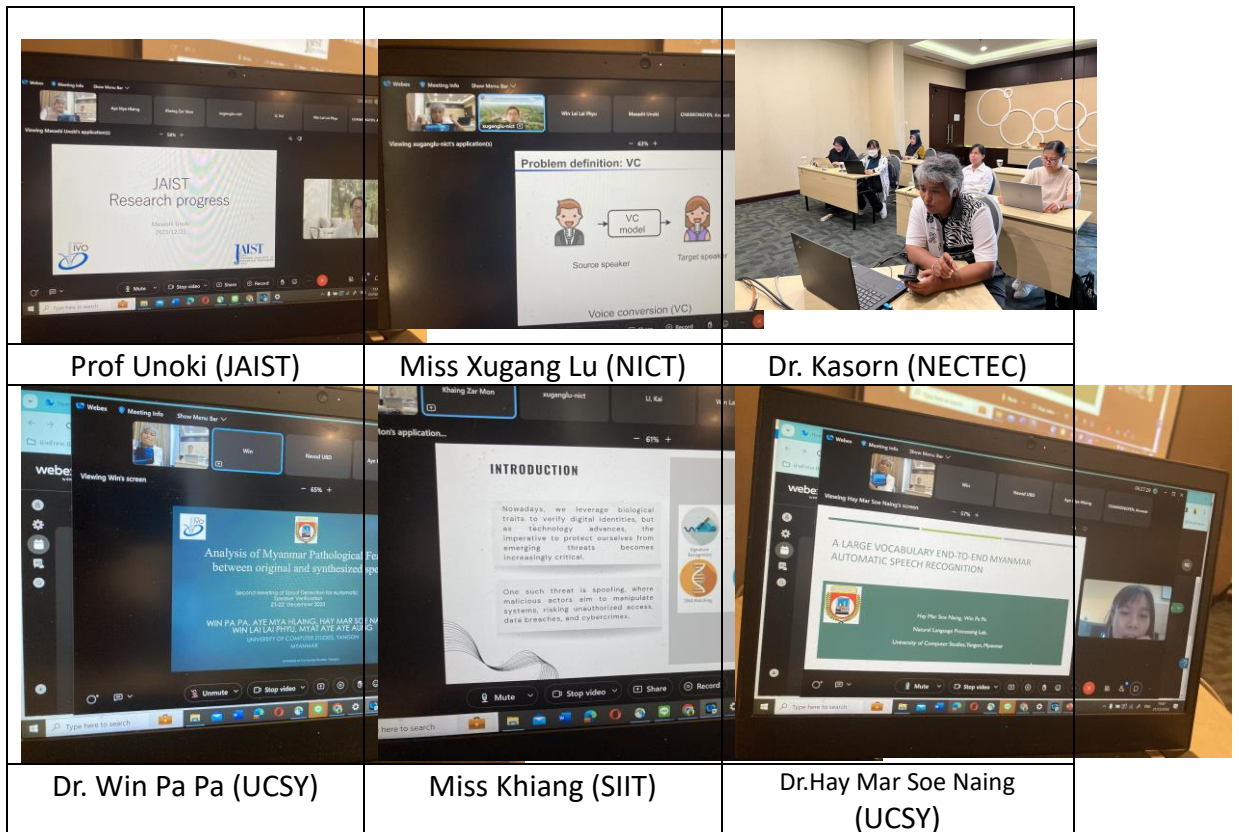Sub-objective - Representative from each institute update about their rearch.

Representative from each institute update about the research status and also the output from each party.

Prof Unoki (JAIST)	Miss Xugang Lu (NICT)	Dr. Kasorn (NECTEC)
Dr. Win Pa Pa (UCSY)	Miss Khiang (SIIT)	Dr.Hay Mar Soe Naing (UCSY)

Myat Aye Aye Aung (UCSY)	Anuwat (JAIST)	LI-KAI (JAIST)

Dr Yassin	Dr Dessi (ITB)

Representatives from each institute updated their projects related to our IVO project and their contributions to this project.

JAIST   Prof Masashi Unoki (also Mr Anuwat and Mr Li-Kai)

NECTEC Dr. Kasorn GALAJIT

UCSY Dr. Win Pa Pa (also Miss Hay Mar Soe Naing and miss Myat Aye Aye Aung)

SIIT   Miss Khaing Zar Mon

NICT Dr. Xugang Lu

UBD Dr Yassin

ITB Dr Dessi

2. <u>Objective 2- To brainstorm solutions to problems caused by work practices.</u>

In this objective, we review the comment which we get from steering committees and we can summarize as follows.

ASEAN IVO projects
Final report, review and progress report
Date: Thursday, November 16
Venue: Lao Plaza Hotel, Lao PDR

Review Result

ASEAN IVO Steering Committee
2023.12.15

No	Status	Project title Project leader	Score
2023-3	ongoing	Spoof Detection for Automatic Speaker Verification Project leader: Dr. Kasorn Galajit, National Science and Technology Development Agency, Pathumthani, Thailand	3.71

Note: the score is the mean of scores evaluated by SC members.
4: excellent, 3: good, 2: normal, 1: bad.

We also discuss the following comments from the steering committee.
Comment 1:
spoofing detection is very important since it can be used to verify whether the claimed voice is a genuine or fake representation before verifying or identifying the speaker's identity. almost 70 % of output already fulfilled.
Answer . no required answer.

Comment 2:
Spoofing of human voice certainly cause identification problem. Hence the method to detect spoof is important. Various type of spoofing method and the quality of the spoofing needs to be studied. The use of AI to make Voice cloning for example should be able to be detected too. In addition, accent for a particular language needs to be taken into account in setting up the data set for a particular language. Someone's voice changes due to various reasons should be able to be recognized and this need attention too.
Answer .
Address from this comment:
Various type of spoofing method especially some cloning or deep fake voice
Accent in each language   (southern style, northern style, etc.)
Voice changing due to age, gender.
Therefore, we should consider these points in our future work.

Comment 3:
A lot of research papers were generated as major scientific contributions of the project.
Answer . no required answer.

Comment 4:
Good progress with many published articles.
Answer . no required answer.

Comment 5:
Very good progress with excellent results.
Achieved results: Kick-off meeting, a second meeting.
Dataset for spoof detection for Thai language
Statistical analysis results for voice and fake audio detection.
Voice spoof detection
Study characteristics of abnormal voice, Speech recognition, Speaker recognition,
Study of tampering speech.
07 publications in international conferences and 01 in IEEE Access journal have been indicated.
Expected: very good results.
Answer . no required answer.

Comment 6:
Targets: Kept as in the project proposal
Project activities: Spoof detection, Automatic speaker identification
Collaboration: 25 members and 3 pending members at NETEC, JAIST, SIIT
Progress: ThaiSpoof dataset, Fake Audio detection, abnormal voice, speech recognition, Pathological features, Speech watermarking
Budget: Good distribution
Outcomes: 2Kickoff meetings done, 1 journal paper and 7 coming papers submitted.
ThaiSpoof dataset, dataset for Fake Audio detection, dataset of abnormal voice, dataset for speech recognition
Answer . no required answer.

Comment 7:
The number of publication exceeds planned number. The contribution from the other member countries is also excellent.
Answer . no required answer.

Comment 8:
The voice can be in a language different from Thai and Burmese
Address from this comment:
We intend to extend to Indonesian language, Then checking for cross language dataset to check whether it is language dependent or not.
Answer . no required answer.

Comment 9:
Very good progress in the first seven months of the project.
A number of tasks related to the project have been completed.
Dataset for Thai language is done.
Seven papers have been accepted or presented.
Answer . no required answer.

Comment 10:
The overarching goals of the project encompass a comprehensive exploration of the significance of speech features in the realm of spoof detection.
The objectives include fine-tuning the percentage of voice and non-voice segments within the utilized features to optimize spoofing detection capabilities.
Additionally, there is a focus on investigating pathological features to further enhance the efficacy of spoof detection methods.
The project aims to minimize detection errors, elevate the accuracy of Automatic Speaker Verification (ASV), and delve into the complexities of multi-lingual spoof detection.

Through these pursuits, the project endeavors to contribute valuable insights and advancements to the field of speech-based security systems.
Comment:
The kick-off meeting for the project took place in April 2023. In the realm of scientific contributions, the project has delved into three-fourths of the initially outlined objectives from the project's inception report. Each team member has actively contributed within their respective domains of expertise, particularly in the field of speech recognition. The team has submitted seven conference papers, with one already published in a journal.
Future work:
In the forthcoming tasks, there will be a focus on the development of APIs and the exploration of cross-dataset considerations.
Answer . no required answer.

Comment 11:
The project has a lot of contributions. The system should be robust for the genuine speakers and imposters.
Answer . no required answer.

Comment 12:
Early stage.
Model training is not clear.
Benchmark against AI generated speech.
Answer . We agree to set up the benchmark against AI since now our spoofed method depends on speech signal processing mostly.

Comment 13:
Interesting works. Might want to share details on the parameters and how they vary between different languages.
Answer . We agree to published our resource and source code on git-hub in order if anyone want to follow our work.

Comment 14:
Excellent progress. There are so many publications you have published. One of the journals was published before this project was awarded.
Answer
Address from this comment.
VOLUME 11, 2023
Received 21 June 2023,
accepted 29 July 2023,
date of publication 3 August 2023,
Digital Object Identifier 10.1109/ACCESS.2023.3301616
Project period , 1 April 2023 – 31 March 2025

But I already answered in the ASEAN IVO Forum that JAIST members are our initial member of our project.

Comment 15:

This project started in April 2023. So far, they have conducted substantial amount of research activities. This includes publishing findings in 7 conferences and 1 journal. Future work includes incorporating the detection of multi lingual (Myanmar language) in their current project. Perhaps they could include various other ASEAN languages such as Malay.

Answer

Address,   We do not have Malaysian member in our team. Also for Myanmar , we are not yet have a spoof dataset. It is only ASV dataset with diarization. However, we intend to do spoofed dataset in Indonesian language which is also Bahamas, which is similar to Malaysia language.

3. Objective 3- To follow the output from each institute

The output from each institute is as follows.
Conference

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
1	ThaiSpoof: A Database for Spoof Detection in Thai Language	• Kasorn Galajit, • Thunpisit Kosolsriwiwat, • Candy Olivia Mawalim, • Pakinee Aimmanee, • Waree Koneprawechnon, • Win Pa Pa, • Anuwat Chaiwongyen, • Teeradaj Racharak, • Hayati Yassin, • Jessada Karnjana, • Surasak Boonkla, • Masashi Unoki.	• NECTEC, National Science and Technology Development Agency, • Sirindhorn International Institute of Technology, • Japan Advanced Institute of Science and Technology, • University of Computer Studies,Yangon, • Universiti Brunei Darussalam}, Brunei Darussalam	The 18th International Joint Symposium on Artificial Intelligence and Natural Language Processing (iSAI-NLP 2023) (https://isai-nlp-aiot2023.aiat.or.th/)	27-29/11/2023	Bangkok, Thailand
2	Spoof Detection using Voice Contribution on LFCC features and ResNet-34	• Khaing Zar Mon, • Kasorn Galajit, • Candy Olivia Mawalim, • Jessada Karnjana, • Tsuyoshi Isshiki, • Pakinee Aimmanee,	• Sirindhorn International Institute of Technology, • NECTEC, National Science and Technology Development Agency, • Japan Advanced Institute of Science and Technology, • Tokyo Institute of Technology Tokyo,	The 18th International Joint Symposium on Artificial Intelligence and Natural Language Processing (iSAI-NLP 2023) (https://isai-nlp-aiot2023.aiat.or.th/)	27-29/11/2023	Bangkok, Thailand
3	Using Novel Hybrid Convolutional Neural Network for Dysarthria Diagnosis	• Navod Neranjan Thilakarathne, • Kasorn Galajit, • Jessada Karnjana, • Win Pa Pa, • Candy Olivia Mawali • Hayati Yassin,	• Universiti Brunei Darussalam}, Brunei Darussalam • NECTEC, National Science and Technology Development Agency, • Japan Advanced Institute of Science and Technology, • University of Computer Studies,Yangon,	The 10th IEEE CSDE 2023, the Asia-Pacific Conference on Computer Science and Data Engineering 2023,(IEEE CSDE 2023) https://ieee-csde.org/csde2023/	4-6/12/2023	Yanuca Island, Fiji

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
4	Speech Watermarking for Tampering Detection Using Singular Spectrum Analysis with a Psychoacoustic Model	• Phondanai Khanti, • Pannathorn Sathirasattayanon, • Patthranit Kaewcharuav, • Nanthavod Termkoh, • Ekachai Phaisangittisagul, • Kasorn Galajit, • Jessada Karnjana	• Sirindhorn International Institute of Technology, • NECTEC, National Science and Technology Development Agency, • Kasetsart University	The 26th Conference of the Oriental COCOSDA https://www.ococosda2023.com/	4-6/12/2023	Delhi, India
5	A Large Vocabulary End-to-End Myanmar Automatic Speech Recognition	• Hay Mar Soe Naing • Win Pa Pa	• University of Computer Studies,Yangon,	M3Oriental Workshop of ACM Multimedia Asia 2023 The ACM Multimedia Asia 2023 https://sites.google.com/view/m3oriental	8/12/2023	Tainan city, Taiwan
6	Deepfake-speech detection with pathological features and multilayer perceptron neural network	• Anuwat Chaiwongyen, • Suradej Duangpummet, • Jessada Karnjana, • Waree Kongprawechnon, • Masashi Unoki	• Japan Advanced Institute of Science and Technology, • NECTEC, National Science and Technology Development Agency, • Sirindhorn International Institute of Technology,	The 15th annual conference organized by Asia-Pacific Signal and Information Processing Association (APSIPA2023) https://www.apsipa2023.org/	31/11/2023-3/12/2023	Teipei, Taiwan

No:	Paper title:	Author names	Affiliation	Conference name:	The date of the conference	The venue of the conference
7	M-Diarization: A Myanmar Speaker Diarization using Multi-scale dynamic weights	Myat Aye Aye Aung, Win Pa Pa, Hay Mar Soe Naing.	• University of Computer Studies,Yangon,,	The 26th Conference of the Oriental COCOSDA https://www.ococosda2023.com/	4-6/12/2023	Delhi, India

Journal

Published Journal Papers:

No:	Paper title:	Author names	Affiliation	Journal name:	The publisher of the Journal	The volume number and Pages
1	Contributions of Jitter and Shimmer in the Voice for Fake Audio Detection	KAI LI, XUGANG LU, MASATO AKAGI, MASASHI UNOKI.	• Japan Advanced Institute of Science and Technology, • Advanced Speech Technology Laboratory, National Institute of Information and Communications Technology,	IEEE Access	IEEE Access	VOLUME 11, 2023 Received 21 June 2023, accepted 29 July 2023, date of publication 3 August 2023, Digital Object Identifier 10.1109/ACCESS.2023.3301616

Moreover, there are a paper which are in process as follow,

JAIST

Journal papers

• Kai Li, Xugang Lu, Masato Akagi, and Masashi Unoki, "Contributions of Jitter and Shimmer in the Voice for Fake Audio Detection," IEEE Access, vol. 11, pp. 2169-3536, 2023.
• Khalid Zaman, Melike Sah, Cem Direkoglu, Masashi Unoki, "A Survey of Audio Classification using Deep Learning," IEEE Access, vol. 11, pp. 106620-106649, 2023.
• Yasuji Ota and Masashi Unoki, "Anomalous Sound Detection for Industrial Machines Using Acoustical Features Related to Timbral Metrics," IEEE Access, vol. 11, pp. 70884-70897, 2023

Conference papers

- Haowei Cheng, Candy Olivia Mawalim, Kai Li, Lijun Wang, Masashi Unoki, "Analysis of Spectro-Temporal Modulation Representation for Deep-Fake Speech Detection," Proc. APSIPA ASC 2023, pp. 1822-1829, Nov. 2023.

- Anuwat Chaiwongyen, Suradej Duangpummet, Jessada Karnjana, Waree Kongprawechnon, Masashi Unoki, "Deepfake-speech Detection with Pathological Features and Multilayer Perceptron Neural Network," Proc. APSIPA ASC 2023, pp. 2182-2188, Nov. 2023.

- Kai Li, Dung Kim Tran, Xugang Lu, Masato Akagi, and Masashi Unoki, "Data-driven Non-uniform Filterbanks Based on F-ratio for Machine Anomalous Sound Detection," Proc. EUSIPCO2023.

We have an activity group discussion as shown in picture.

V. Others

We also have a chance to visit the lab in ITB as shown in the picture below.