

Tune

Tohoku University Research News of Engineering

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2019

What is AI

COMMUNICATIONS?

Takashi NOSE



Ranking & Data
TOHOKU UNIVERSITY



What is AI COMMUNICATIONS?

Text by S. "Tex" POMEROY / Photographs by Hayato IKEGAMI

Use of the term "Artificial Intelligence (AI)" seems to be the current trend nowadays, but with even the proverbial kitchen sinks being referred to as AI, let us as true scholars try to clarify what this phrase means before we attempt to delve deeply into related activities at Aobayama Campus, lest we get lost in a twilight zone filled with Big Data, Smart Speakers and other buzzwords.

AI means a man-made computational system which depicts intellect, like those shown by humans upon problem-solving through combination of pattern recognition and other faculties (senses) we possess. One of the famous AI projects today is IBM's Watson, a "cognitive computing" effort that in recent years has gained press by collaborating with high-end womenswear brand Marchesa for an "AI" dress.

However, specifically for AI efforts at Tohoku University's Department of Communications Engineering, the information processing thrust has in particular targeted speech communication and synthesis... that is, when analogized to the human intellect, our brain using voice as produced by the throat and mainly perceived by the ear among other senses for verbal exchanges. We asked Dr. Nose about the approach he is taking.

You're utilizing the Japanese cultural aspect of characters/Anime for your research endeavors?

Dr. Nose: Yes, I wished to increase interest levels among students in addition to heightening commercial motivations for local enterprises, since Anime and visual processing offer much added-value business openings. Rather than melding human depictions with illustrations and renderings, we went all two-dimensional.

And you blended in your voice synthesis expertise with Anime. What else?

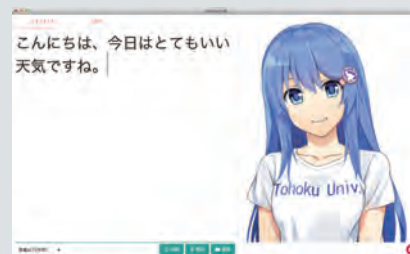
N: In addition to communicating with my students conventionally, I am conducting research on "Photo-realistic Virtual Clones" (created using Machine Learning based on real movie samplings of target speakers) to replicate facial features that for example entail "lip synch." Upon realizing such "AI communications" work, intense R&D efforts in the area of Deep Learning are required, since the emotion exhibiting intelligent responses contained in the speech and accompanying mouth movement must be convincingly replicated.

Why did you begin this line of research?

N: My chosen field was Intelligent Communication Network Engineering. Actually, I was fascinated by voice changer devices when a student, whether

Dr. Takashi NOSE

Takashi Nose holds a B.E. (2001) in electronic information processing from Kyoto Institute of Technology. In 2009 he received his Dr.Eng. degree in information processing from Tokyo Institute of Technology (TokyoTech). He was an Intern Researcher at ATR Spoken Language Communication Research Laboratories (ATR-SLC) from 2008 to 2009, before becoming a TokyoTech Assistant Professor in 2009. He became a Lecturer at Graduate School of Engineering, Tohoku University, in 2013, and currently Associate Professor at the same school. A member of IEEE, ISCA, IEICE, etc., his research interests include speech synthesis, speech recognition, spoken dialogue system and music information processing.



it be used by Anime characters or Tom Cruise in "Mission: Impossible." My research interests now lie in perception information processing as well as intelligent robotics.

Machine Learning, Deep Learning

Can you tell us how Machine Learning relates to Artificial Intelligence?

N: Today's Artificial Intelligence research is based mostly on perception information/natural language processing and Machine Learning, grounded in iterative activities allowing computers to find the "best" method of solving a problem. Machine Learning makes use of computer features, namely its accurate repetitive operations and fast calculation ability as well as endless "stamina" in searching for solution(s), to hone in on an optimal method.

You mentioned Deep Learning?

N: Indeed, when conversation – the spoken dialogue – becomes involved, even more work is needed to perfect the Clones (or robots/agents) so as to reflect the "real world"... by going beyond just pattern recognition, static model and test pattern generation. In order to enable multimodal interpretations needed upon maintaining meaningful communications, much more must be learned.

Learning ties in with educational motivation too?

N: Yes, I'm motivated not only wanting to increase my knowledge but by positive changes that may be brought forth from my work, enriching people's lives. I think my colleagues and students are also excited that they are helping to open up new frontiers ranging from art and entertainment to media and society in general, whether with avatars or sensors.

No Business Like News Business

With data growing every minute and "smart" stuff galore, if not a clone some means of "augmenting" intelligence might be quite desirable.

N: That appears to be the sentiment of many journalists these days. Whether in the form of two-dimensional representations or humanoid robots, I understand many broadcasters in Japan and overseas are attempting to realize virtual announcers, narrators and news anchors... so, we have taken on this technical challenge as well.

For reporters, announcers, narrators and news anchors are considered "intelligent agents." Such people would need to be qualified to handle sensitive information or risky situations.

N: As noted earlier, without adaptability and versatility not to mention intelligence, a conversation could not be sustained nor can situations be adeptly negotiated. Perhaps even like detectives and secret agents, heroes in Anime and movies I grew up with: quick thinking on their feet, yet knowledgeable. But in the future they may not necessarily be people.

Future Plans

Intelligence, agents... anything to do with security?

N: "Tom Cruise Mission: Impossible" stuff? Well, actually this research could be used to reduce crimes like spoofing or improve security through enhanced access control based on voice, for cyberspace as well as otherwise. It should realize safer environs for both

children and the elderly too. It could even be applied to health diagnosis and possibly tailor-made medicine.

What other plans are in the offing?

N: There are planned projects such as an attempt to produce virtual singers or idols, though phonetic refinements are still a long way off, because we need to identify various issues involved. We are also eyeing means of estimating a person's age with voice alone, though some students may become unable to buy cigarettes if we are successful. Habits, like motivations, can be altered however, such as through strong emotion!

Conclusion

Learning/Inculcation does temper emotions, indicating growth and maturity.

N: Speaking of inculcation, let us conclude by noting the research direction at Tohoku University in this area. We have been selected to be an Excellent Graduate School Program (TAKUETSU*), which targets inculcation of individuals with doctoral degrees who can take leading roles over a variety of sectors, not to mention creating hubs for sustained promotion of human resource development plus exchange. Moreover, joint research will be promoted.

*TAKUETSU programs

The AI Electronics program headed by Professor Toshiro Kaneko (Graduate School of Engineering) is one of the Tohoku University programs selected, along with another biomed-focused program. TAKUETSU programs look to enhance high-level human resources for promoting social implementation of research results and give their research results back to society. They will run for a seven-year span from 2018-2019 until 2024-2025.





University Ranking

77

QS

QS World University Rankings 2019

36

Reuters Top 100:

The World's Most Innovative Universities 2018

101

ARWU

Academic Ranking of World Universities 2018

23

QS Asia

QS Asia University Rankings 2019

3

JUR

THE Japan University Rankings 2018

QS

QS World University Rankings by Subject 2019



Engineering & Technology



Engineering -
Computer Science &
Information Systems



Engineering -
Electrical & Electronic

ARWU

ShanghaiRanking's Global Ranking of Academic Subjects 2018



Telecommunication
Engineering



Electrical &
Electronic
Engineering



Computer
Science &
Engineering



Statistics 2018

	Tohoku University	School of Engineering
 STUDENTS-TO-FACULTY RATIO	 1 : 6	 1 : 9
 NUMBER OF FACULTY	 3,152	 615
 NUMBER OF INTERNATIONAL STUDENTS	 2,089	 578
 UNDERGRADS	 10,881	 3,540
GRAD STUDENTS (MS)	4,279	1,542
GRAD STUDENTS (PhD)	2,664	516

Sendai, the home city of Tohoku University

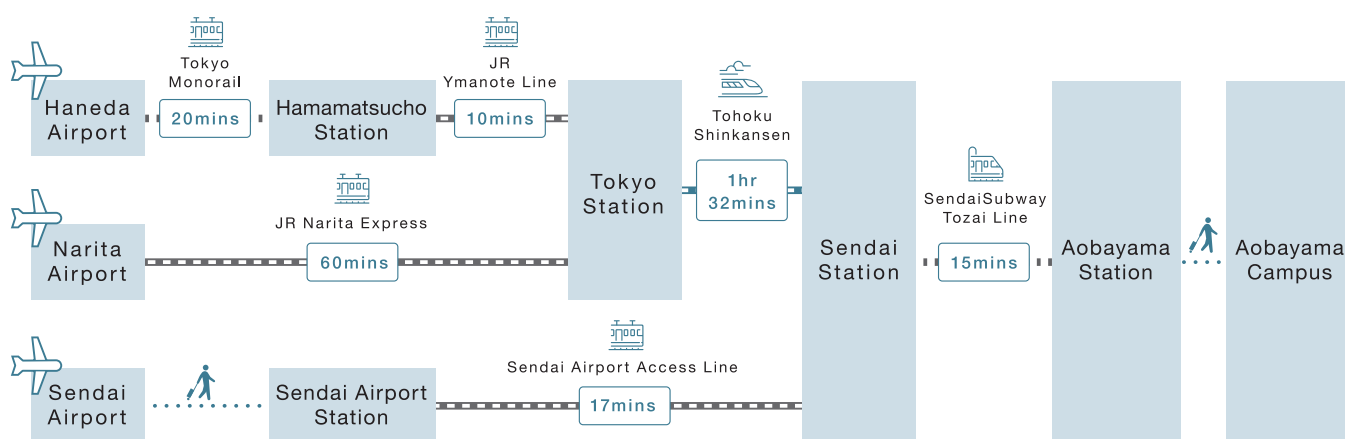
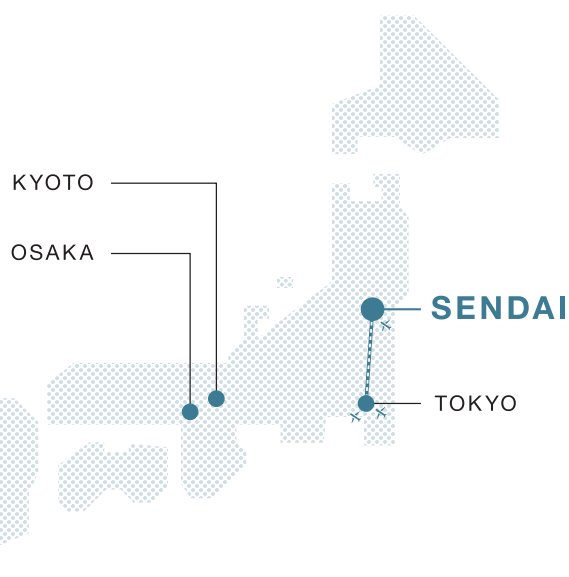


SENDAI ✈️ At a Glance

Average Temp. **12 °C**

Precipitation **1241 mm**

Sunshine **1843 hours**



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