AI in and for Education and Vice Versa

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AI in Education

- **AI has been at the core of education at SUSTech since the Department of CSE was founded in summer 2016.**

AI in Education: Curriculum

- **Not only do we offer a broad range of electives in AI, including Artificial Intelligence, Advanced Artificial Intelligence, Machine Learning, Deep Learning, Data Mining, Intelligent Data Analysis, Computer Networks and Big Data, Intelligent Robotics, etc.;**
- **we also have a new major in AI, called Intelligent Science and Technology （智能科学与技术）.**
- **More than half of our 40+ strong academic staff members are working in AI or AI related research topics.**

AI in Education: People

- **We have some of the best people in the world as our faculty members.**

AI in Education: People – Hisao Ishibuchi

- **IEEE Fellow**
- **Editor-in-Chief of IEEE Computational Intelligence Magazine (IF: 6.611)**
- **Associate Editor of IEEE Transactions on Evolutionary Computation (IF: 8.124), IEEE Transactions on Fuzzy Systems (IF: 8.415), and many others**
- **Winner of the 2019 IEEE Computational Intelligence Society Fuzzy Systems Pioneer Award**
- **Winner of the 2007 JSPS Prize**
- **Invited keynote speakers at numerous international conferences**
- **Google Scholar citations: 24,171, H-index: 68.**

AI in Education: People – Yuhui Shi

- **IEEE Fellow**
- **Need I say more? The numbers speak for themselves.**

Yuhui Shi - Google Scholar Citations

scholar.google.com/citations?user=xSvAHWgAAAAJ&hl=en

22 rows · This "Cited by" count includes citations to the following articles in Scholar. The ones marked …

TITLE	CITED BY	YEAR
Swarm intelligence J Kennedy Handbook of nature-inspired and innovative comput…	12699	2006
A modified particle swarm optimizer Y Shi, R Eberhart 1998 IEEE international conf…	11964	1998
Particle swarm optimization: developments, applications and resources Y Shi Proc…	4981	2001
Empirical study of particle swarm optimization Y Shi, RC Eberhart Proceedings of t…	4544	1999

AI in Education: People – Xin Yao

- **IEEE Fellow**
- **2020 IEEE Frank Rosenblatt Award**
- **2013 IEEE Computational Intelligence Society Evolutionary Computation Pioneer Award**
- **2012 Royal Society Wolfson Research Merit Award**
- **2010, 2016 and 2017 IEEE Transactions on Evolutionary Computation Outstanding Paper Awards**
- **2011 IEEE Transactions on Neural Networks Outstanding Paper Award**
- **2001 IEEE Donald G. Fink Prize Paper Award**
- **Invited keynote speakers at 100+ international conferences**
- **Google Scholar citations: 45,080, H-index: 94.**

AI in Education:
Mid and Early Career Researchers

- **We have some of the best Mid and Early Career Researchers in the world as our faculty members.**
- **Ke Tang**
  - **Royal Society Newton Advanced Fellow**
  - **IEEE Computational Intelligence Society Outstanding Early Career Award**
- **Ran Cheng**
  - **IEEE Computational Intelligence Society Outstanding PhD Dissertation Award**

AI in Education: Joseph Sifakis

- 2007 Turing Award Laureate
- Member of
  - French Academy of Sciences
  - French National Academy of Engineering
  - Academia Europea
  - American Academy of Arts and Sciences
  - National Academy of Engineering (USA)
- A Grand Officer of the French National Order of Merit
- A Commander of the French Legion of Honor
- Leonardo da Vinci Medalist in 2012.

OK, OK!

- **You have recruited lots of AI-related faculty members and offered a rich set of AI courses and even a new major.**

- **But what has AI done to support education at SUSTech?**

AI for Education: Research Infrastructure

- **SUSTech Artificial Intelligence iNstituTe (SAINT)**
- **Shenzhen Key Laboratory of Computational Intelligence (SKyLoCI)**
- **University Key Laboratory of Evolving Intelligent Systems of Guangdong Province**

AI for Education: *Some* Activities

- **We organise *many* workshops on various research topics. The next one will be on August 2-3, 2019, on Dynamic Evolutionary Optimisation and Applications.**

- **We host research visitors, including professors *and* students. We will cover all the costs.**

AI for Education: Collaboration with Industry

- **SUSTech-Haylion Centre for Intelligent Transportation**
  - **Autonomous driving**
  - **MaaS**
- **Huawei**
  - **Fault diagnosis, reliability, trustworthy systems**
  - **Neural network architecture design and optimization**
  - **Big data analytics, mega-city urban computing and management systems**
  - **Video analytics**
- **Honda (Germany)**
  - **Concurrent engineering, evolutionary optimization**
- **Tencent**
  - **Machine learning**
  - **Chatbot**
- **Many others**

Collaboration Opportunities

- **Smart logistics**
- **Condition monitoring and fault diagnosis**
- **Data-driven modelling of new materials (e.g., alloys or chemicals)**
- **Designing novel shapes (e.g., for cars, aircraft wings, etc.)**
- **Text analysis and classification**
- **Fraud and corruption detection from unstructured data**
- **User behavior analysis and prediction from big data**
- **… …**

Could you stop talking about research?

- **This is a conference about education!**

- **What should we do in our education programmes to better prepare learners/students for the so-called AI era?**

Hmmm…

- **Education is hard.**
- **Education for AI is harder.**
- **Here are some questions.**

Education for AI: Science vs. Engineering

- **Are we going to teach AI as a scientific discipline or as application tools?**
- **It is hard to cover both *in depth* for any undergraduate programme. There is simply not enough time.**
- **What should we do?**

Education for AI: The SUSTech Approach

- **We emphasize fundamentals.**
  - **Computer science and mathematics (including statistics) are our core.**
- **We emphasize abstract thinking.**
  - **To truly understand AI well, we need to change the way we think and reason about the world around us. Computational thinking is important.**
- **We emphasize problem-solving.**
  - **Real world is full of challenging problems, but none of them has any discipline labels attached to it. They come just as problems.**
- **We emphasize ethics, professionalism and social responsibility.**
- **We emphasize inter-/multi-/cross-disciplinarity.**

But How?

- **In addition to conventional classroom teaching, we have compulsory group projects, called “Innovation Projects”（创新实践课）, which run through the entire third year and the first semester of the fourth year.**
  - **Problem-driven, project-based**
  - **2-3 students per group, supervised by a professor and sometimes an industrial co-supervisor**
  - **Product / system oriented**
  - **Students are required to solve a problem, from requirement analysis, system specification, design, implementation, testing, to the final system.**

What Could 3rd Year Students Do? (I)

- **Motion planning in autonomous vehicles using deep reinforcement learning**
- **Deep Learning Based LiDAR Camera Real Time Fusion for Practical Multi-Sensor Systems**
- **Hand Tracking and Gesture Recognition based on mmWave Radar**
- **Human pose estimation**
- **Material classification by mmWave**
- **Non-contact breath and sleep detection based on mmWave radar**
- **Data publishing with differential privacy**

What Could 3rd Year Students Do? (II)

- **Asymmetry image-to-image translation using generative adversarial networks**
- **Smart Cooperative CPU/GPU workload scheduler**
- **Discovering Top-k Newsworthy Facts from Multidimensional Dataset**
- **Product Introduction with Limited Budget and User Distributions**
- **Understanding and detecting accessibility issues in web applications**
- **Compatibility test case generation for Android applications**

What Could 3rd Year Students Do? (III)

- **User review classification for mobile apps**
- **Distributed synchronization algorithms for large-scale multiplayer games**
- **Analysis and Diagnosis of Glaucoma Based on Deep Learning Methods**
- **Traffic information recovery and estimation in smart city urban transportation**

Concluding Remarks

- **AI has been part of computer science curricula for decades.**

- **SUSTech CSE offers a rich range of AI related course and a major in AI, delivered by world class faculty members.**

- **The key to learning AI is not about knowledge (知识点). It is more about abilities and capabilities (能力). AI knowledge (知识点) is necessary in our teaching but not sufficient. It is the abilities and capabilities that we must emphasize in our education programme.**