



# UNIVERSITY OF GEORGIA

## Institute for Artificial Intelligence AI Newsletter

Fall 2018

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### 30 Years of the MSAI Degree

Congratulations to **Brent Lippert**, who has successfully defended his MS thesis "Prediction of Cancer-Related Mutation Impact on Protein Activity Using Machine Learning", written under the direction of **Dr. Khaled Rasheed** and **Dr. Natarajan Kannan** (Department of Biochemistry and Molecular Biochemistry). Brent joined the Institute as an honors undergraduate student, completing his bachelor's degree in 2017.

Congratulations also to **Andrew King** ("A Comparison and Extension of Deep Learning Methods for Semantic Segmentation", under the direction of **Dr. Suchendra Bhandarkar**) and **Yan Du** ("Automatic Detection and Segmentation of Greenhouse Fruit Using Deep Neural Networks", under the direction of **Dr. Yi Hong**), who successfully defended their theses this spring.

Brent's successful defense marks the 30th anniversary of the Institute (in its various incarnations) awarding master's degree in artificial intelligence, and Yan is the 200<sup>th</sup> graduate of the MSAI program. To our knowledge, UGA is one of only two institutions in the United States to offer an interdisciplinary master's degree specifically in AI. What is now the Institute for Artificial Intelligence began in 1984 as a research group led by **Drs. Donald Nute** and **Michael Covington**. It became the Artificial Intelligence Center in 1995 and the Institute in 2008. The MSAI was approved in 1987 and the AB in Cognitive Science in 1994. Dr. Rasheed is the third person to lead AI at UGA after Dr. Nute and **Dr. Don Potter**.

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### New Faculty Fellows

The Institute is pleased to welcome several new Faculty Fellows, who join us from departments across campus.

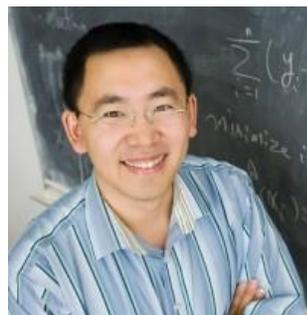
**Dr. Jennifer Gay:** Dr. Gay is a professor in the Department of Health Promotion and Behavior in the College of Public Health, with a primary focus on physical activity and public health. Her AI-related interests are human activity recognition, accelerometry, and AI applications to public health.

**Dr. John Hale:** Dr. Hale joins UGA as a professor in the Department of Linguistics. He is a computational linguist with an extensive background in cognitive science and AI.

**Dr. Ping Ma:** Dr. Ma is a professor in the Department of Statistics, with research interests in big data analytics, bioinformatics, and statistical learning. His research aims to develop theory and methods to solve complex scientific and engineering problems with broad societal impact.

**Dr. Lakshmish Ramaswamy:** Dr. Ramaswamy is a professor in the Department of Computer Science and the Associate Director of the recently formed Georgia Informatics Institutes for Research and Education. Among his research interests are Data Intensive Systems, Pervasive Systems, Cloud Computing, and Health Informatics.

They join other UGA faculty who recently decided to become AI Faculty Fellows, including **Dr. Jason Anastasopoulos** (Department of Political Science), **Dr. Yi Hong** (Computer Science), and **Dr. Jaewoo Lee** (Computer Science).



Left to Right: Drs. Jennifer Gay, John Hale, Ping Ma, and Laksmish Ramaswamy

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## New Rooms

For much of its history, the Artificial Intelligence group at UGA occupied a portion of the first floor of Boyd Hall. More precisely, it moved to the office suite in 111 in 1989, and there it remained for roughly 29 years.

In the summer of 2018, however, it moved to make room for UGA's growing engineering programs. AI is now located on the 5<sup>th</sup> floor of Boyd, close to computer science and mathematics. The new offices, freshly painted and carpeted, provide three good communal spaces for students as well as sufficient space for a small microelectronics lab. The move itself was fascinating, with artifacts of AI's history (newspaper clippings, 5.25" disks, the keyboard for an LMI Lambda Lisp machine) being rediscovered.

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## Student Spotlight: Ava Wright

Soon to graduate is doctoral candidate in Philosophy and MSAI student **Ava Wright**. Ava came to UGA having already received a JD and MA from Georgia State University and a BA from Rice University in Houston.

For her master's work, Ava is exploring the regulation of semi-autonomous agents. "I'm interested in both the ethical and legal principles appropriate for regulating such agents, as well as the technical problem of how to go about implementing those principles in an actual agent."



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## Faculty Research and News

- In April of this year, it was announced that **Dr. Tianming Liu** (Department of Computer Science) has been inducted into the College of Fellows of the **American Institute for Medical and Biological Engineering (AIMBE)**, for "for outstanding contributions to quantitative mapping of structural and functional brain architectures using neuroimaging data."<sup>1</sup> Founded in 1991, the non-profit AIMBE consists of over 50,000 members and promotes medical and biomedical engineering for the benefit of society.
- In May 2018, the 1<sup>st</sup> **Deep Learning & Security Workshop** was held in San Francisco. The workshop, co-located with the 9th IEEE Symposium on Security and Privacy, brought together researchers and practitioners interested in the impact of rapidly advancing machine learning techniques on security. It was co-organized by **Dr. Roberto Perdisci** (Department of Computer Science).
- **Dr. Prashant Doshi** (Computer Science) and **Dr. Adam Goodie** (Psychology) have been awarded a grant to study why some people choose to evacuate the path of hurricanes while others choose to stay and weather the storm. They will collect data from those affected by recent hurricanes Irma and Harvey and ultimately develop computational models of decision making involving risk. This is one of a set of 59 disaster-related grants awarded by the NSF in 2017.
- Congratulations to **Dr. Pete Bettinger** (Forestry and Natural Resources), who this summer was honored as a Fellow in the Society of American Foresters for "long-standing service to forestry at the local, state, and national levels." This is considered to be one of the highest honors that the Society can bestow on its members.
- This spring, MSAI student **Maulik Shah** was chosen for his work with EITS as one of the top 100 student employees on-campus. Maulik, working under Dr. Doshi, is investigating open agent systems (OASYS) where agents may join, exit the system, and resume their roles due to evolving circumstances.

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## Enrollment Statistics

### Master of Science in Artificial Intelligence

- 2016: 22 enrolled students
- 2017: 33 enrolled students
- 2018: 73 processed Fall 2018 applicants, 33 admitted

### Bachelor of Arts in Cognitive Science

- 2016: 114 majors (in fall)
- 2017: 125 majors (in fall)
- 2018: 147 majors (in spring)

The discrepancy between fall and spring can be attributed to those choosing the major mid-year and seniors graduating.

The Institute also admitted 15 so-called *Double Dawg* students. These undergraduate students can begin taking 6000-level courses in Fall 2018, which would count toward both their undergraduate degrees and the MSAI degree, should they be admitted into the graduate program.

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<sup>1</sup> <http://aimbe.org/press/Liu-COF-3080.pdf>

## Recent MSAI Graduates

- **Brittany Norman** (Dr. Khaled Rasheed), "Computational methods for categorizing unstructured data related to pediatric appendicitis within electronic medical records"
- **Jesse Kuzy** (Dr. Changying Li), "Post-harvest quality evaluation by pulsed thermographic inspection"
- **William Samuel Sanders** (Dr. Frederick Maier), "Machine learning techniques for Weather Forecasting"
- **Brent Lippert** (Dr. Khaled Rasheed), "Prediction of cancer-related mutation impact on protein activity using machine learning"
- **Andrew King** (Dr. Suchendra M. Bhandarkar), "A Comparison and Extension of Deep Learning Methods for Semantic Segmentation"
- **Yan Du** (Dr. Yi Hong): "Automatic Detection and Segmentation of Greenhouse Fruit Using Deep Neural Networks"

## Lagniappe

**Many Partings!** When Dr. Don Potter retired after many years of service to UGA and the AI Institute, we threw a going away party. It was great to have members of the AI community—both past and present—come together to pay their respects and to wish Dr. Potter well.



## The Master of Science in Artificial Intelligence Program at the University of Georgia

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**Abstract**—*The interdisciplinary Master of Science program in Artificial Intelligence at the University of Georgia is intended to prepare students for careers as developers of artificial intelligence applications or for further graduate work in artificial intelligence or related areas. The program includes foundational courses in computer science, linguistics, logic, philosophy, and psychology as well as specialized courses in artificial intelligence programming languages and techniques. Seminars emphasize knowledge-based systems, natural language understanding, and logic programming. Students are admitted to the program with degrees in many areas including business, computer science, education, linguistics, philosophy, and psychology. A liberal undergraduate education with some previous experience in computing is desirable. It normally takes two years to complete all prerequisites, all required courses, and the thesis.*

In the early days of AI at UGA, a description of the MS program appeared in the journal *Expert Systems with Applications* (Vol. 4, pp. 185-193, 1992). The program had already been in existence for about 5 years.

The abstract is interesting enough that we reprint it here. Though the research foci have changed over the years, the central tenant of AI at UGA, that AI research is **Interdisciplinary**, remains intact.

## Letter from the Director

It is a wonderful time to be in AI! There is hardly a day that goes by without some news about AI in the media. There is much interest in autonomous vehicles and Robotics, data mining and machine learning, sentiment analysis and NLP, etc. Furthermore, despite setbacks like the recent Tesla fatality, the sentiment remains very positive. Our Institute is growing rapidly. At the beginning of spring, our Cognitive Science program had 147 majors and 36 minors. Our MSAI program increased by 50% to 33 students in fall 2017 up from 22 in fall 2016. In addition we received a record number of 73 MSAI applications for fall 2018 and admitted 33. We have reached a major milestone of 200 MSAI graduates. Our MSAI student Ava Wright was recently awarded the Joseph Bertram Gittler Fellowship. Our AI faculty fellows have welcomed seven new members since the last newsletter: Yi Hong, Jaewoo Lee, Jason Anastasopoulos, John Hale, Lakshmith Ramaswamy, Ping Ma and Jennifer Gay. Professor Tianming Liu, another AI faculty fellow, was recently recognized as a Distinguished Research Scientist by UGA. Professors Liu and Prashant Doshi have been awarded the Creative Research Medal by UGA and Professor Roberto Perdisci was awarded the Michael F. Adams Early Career Scholar Award.



We have wonderful research projects centered at the Institute, including those focused on human activity recognition, solar radiation and weather prediction, and we are collaborating on projects studying cancer mutation impact and autonomous agents.

We are finishing up moving to the fifth floor, which is a major undertaking. Many thanks go to Fred and Sonya for doing most of the work. We are also in the process of reconstructing our industrial advisory board and suggestions for potential members are most welcomed. Finally, I would like to encourage our alumni to let us hear from you. We are always keen to hear about your latest activities. Keep in touch!

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## Selected Publications and Presentations

- Boddula V, Ramaswamy L, Mishra D. A Spatio-Temporal Mining Approach for Enhancing Satellite Data Availability: A Case Study on Blue Green Algae. IEEE International Congress on Big Data, Honolulu. 216-223. 01 Jun 2017.
- Chandrasekaran M, Doshi P, Zeng Y, Chen Y. Can bounded and self-interested agents be teammates? Application to planning in ad hoc teams. *Autonomous Agents and Multi-Agent Systems* 31(4):821-860 Jul 2017.
- Das S, Bhandarkar SM. Local Geometry Inclusive Global Shape Representation. ICCV Workshops. IEEE Computer Society. 1256-1265, 2017.
- Hong Y, Golland P, Zhang M. Fast Geodesic Regression for Population-Based Image Analysis. International Conference on Medical Image Computing and Computer Assisted Intervention 2017, Quebec City, Quebec, Canada, 10-14 Sep 2017.
- Hong Y, Yang X, Kwitt R, Styner M, Niethammer M. Regression Uncertainty on the Grassmannian. The 20th International Conference on Artificial Intelligence and Statistics, Fort Lauderdale, Florida, USA, 20-22 Apr 2017.
- Kumar ACS, Bhandarkar SM. A Deep Learning Paradigm for Detection of Harmful Algal Blooms. 2017 IEEE Winter Conference on Applications of Computer Vision (WACV 2017), 743-751.
- Kuzy J, Jiang Y, Li C. Blueberry bruise detection by pulsed thermographic imaging. *Postharvest Biology and Technology* 136:166-177, Feb 2018.
- Niazi A, Yazdarsepas D, Gay JL, Maier F, Ramaswamy L, Rasheed K, Buman M . Statistical analysis of window sizes and sampling rates in human activity recognition. Proceedings of the 10th International Conference on Health Informatics (HEALTHINF 2017), Porto, Portugal, 21 Feb 2017 - 23 Mar 2017.
- Renwick MEL, Olsen RM. Analyzing dialect variation in historical speech corpora. *The Journal of the Acoustical Society of America* 142(1):406-421 Jul 2017.
- Sun, X., Du, P., Wang, X., and Ma, P.(2017) Optimal penalized function-on-function regression under a reproducing kernel Hilbert space framework, *Journal of the American Statistical Association*, accepted.
- Sahoo, K., S. Mani, L. Das, and P. Bettinger. 2018. GIS-based sustainable assessment of crop residues for optimal siting of biogas plants. *Biomass and Bioenergy*. 110: 63-74.
- Sonu E, Chen Y, Doshi PJ. Decision-Theoretic Planning under Anonymity in Agent Populations. *Journal of Artificial Intelligence Research (JAIR)* 59:725-770 01 Aug 2017.
- Wang H, Zhu R, Ma P. Optimal Subsampling for Large Sample Logistic Regression. *Journal of the American Statistical Association*, 30 Dec 2017.
- Xu R, Li C, Paterson AH, Jiang Y, Sun S and Robertson JS (2018) Aerial Images and Convolutional Neural Network for Cotton Bloom Detection. *Front. Plant Sci.* 8:2235. doi: 10.3389/fpls.2017.02235

### How to Sponsor Research

As an industrial partner or associate of the IAI, you can be involved in our research in four ways:

**Collaboration**, especially student projects. It doesn't necessarily cost anything to work with us. We are always looking for good research topics, especially for master's theses.

**Sponsored research**. You can contract with us through the University of Georgia Research Foundation (UGARF) to do research for your company. *We are always looking for research sponsors.*

**Donations**. If you don't need confidentiality or a specific deliverable, you can simply make a gift to the IAI designated to support a particular research program. Donations are made through the Arch Foundation and are fully tax-deductible.

**Consulting**. You can hire faculty members or graduate students to work for you part-time as independent contractors. The University encourages this. It's a good way to do a small project with a high level of confidentiality.

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*For more information about the Institute's activities, e-mail [shbrooks@uga.edu](mailto:shbrooks@uga.edu) or look at [www.ai.uga.edu](http://www.ai.uga.edu).*