

MIE451: Prompt Engineering Assignment

Q1 (1.5 Points). Task Definition and Motivation

(a) Task Description:

My subtask involves extracting key information from one or a few paragraphs. Specifically, given the short biography of a professor which can be found in their homepage, I want to extract the name of the professor, the institution he/she works at, and their research interests. Obviously, the input is the biography, and we will prompt the LLM to output a JSON with the three fields “name”, “school”, and “research interests”.

(b) Evaluation Metric:

I will assess the success of the LLM at getting the name, institution and research interests right, and simply compute the mean. The name and institution are associated with a binary score of 1 (correct) or 0 (wrong). The score on the research interests will be computed using the rubric below. This is because it is not always possible to extract a ground truth list of research interests of a professor (as some do not explicitly mention it, but rather discuss what they are working on). Note that the rubric is designed to focus more on recall than precision; this is because empirically, I found that the LLM never made up research interests that didn't already appear.

Rubric for Research Interests:

0/3	1/3	2/3	3/3
None of Professor's Research Interests appear in LLM output.	Only some of Professor's research interests appear in LLM output.	Most of Professor's research interests appear in LLM output.	All of Professor's research interests appear in LLM output.

Contingency Table:

Annotator 0/1	0/3	1/3	2/3	3/3
0/3	0	0	0	0
1/3	0	0	0	0
2/3	0	0	8	0
3/3	0	0	0	24

Kappa Score: There is perfect agreement amongst the judges, which is obviously a relief for us, and a sign of the reliability of human judgment. Since there is perfect agreement between the judges, the Kappa score is 1.

(c) Motivation:

This task is important as one component of a system used for Decision Support because given a list of biographies of professors, it helps extract some of the most useful information we would care about. For example, students applying to graduate school may not want to read entire biographies; and only desire

the name of the professor (who to contact), their school (for prestige), and their research interests (to see if there is a match). Another example includes students who are applying for summer research positions. For the same reasons mentioned before, they may only care about the professor's research interests, and not so much about their history, affiliations, awards or past students.

Q2 (1.5 Points). Data Curation

(a) Example listing

Here are 5 test examples:

Input	Sample Output
<p>Martial Hebert is the Director of the Robotics Institute at Carnegie Mellon University. His work is in the areas of computer vision, perception for autonomous systems, and machine learning. Hebert has played a role in such high-profile projects as NavLab, a pioneering program for self-driving vehicles, and in leading the development of perception capabilities for personal care robots in the Quality of Life Technology Center. His research interests include computer vision, especially recognition in images and video data; model building and object recognition from 3-D data; and perception for mobile robots and intelligent vehicles. His group has developed approaches to object recognition and scene analysis in images, 3-D point clouds and video sequences. His most recent work addresses reducing supervision in machine learning through small sample learning techniques.</p>	<pre>{ "name": "Martial Hebert", "school": "CMU", "research interests": ["computer vision", "model building from 3-D data", "object recognition from 3-D data", "perception for mobile robots", "intelligent vehicles"] }</pre>
<p>Vivienne Sze is an associate professor in MIT's Department of Electrical Engineering and Computer Science. Her group works on computing systems that enable energy-efficient machine learning, computer vision, and video compression/processing for a wide range of applications, including autonomous navigation, digital health, and the internet of things. She is widely recognized for her leading work in these areas and has received many awards, including faculty awards from Google, Facebook, and Qualcomm, the Symposium on VLSI Circuits Best Student Paper Award, the IEEE Custom Integrated Circuits Conference Outstanding Invited Paper Award, and the IEEE Micro Top Picks Award. As a member of the Joint Collaborative Team on Video Coding, she received the Primetime Engineering Emmy Award for the development of the High-Efficiency Video Coding video compression standard. She is a co-author of the book entitled "Efficient Processing of Deep Neural Networks".</p>	<pre>{ "name": "Vivienne Sze", "school": "MIT", "research interests": ["energy-efficient machine learning", "energy-efficient computer vision", "energy-efficient video compression/processing", "autonomous navigation", "digital health", "internet of things"] }</pre>
<p>Dr. Sanjiv Singh is an innovator, educator, and entrepreneur. He is currently a Consulting Professor at the Robotics Institute, Carnegie Mellon University and the CEO of Near Earth Autonomy, a start-up that develops autonomy for next-generation aircraft that will inspect infrastructure, deliver cargo, and transport people.</p> <p>Dr. Singh started his career in 1985, working on the first autonomous ground vehicles to operate outdoors. Since then, he has led research and development efforts with applications in aviation, agriculture, mining, and construction. In 2010 he led a team that demonstrated the first autonomous full-scale helicopter capable of take-off, landing zone evaluation, and safe descent. In 2011 he led the autonomy effort for Transformer, DARPA's flying car program. From 2012-2017, he led the perception efforts for ONR's AACUS program that demonstrated high-performance autonomous flight for three classes of rotorcraft. He currently leads several autonomous aerial cargo transport and inspection projects. Dr. Singh obtained his Ph.D. in Robotics at Carnegie Mellon in 1995. He is the founding editor of the Journal of Field Robotics, a TEDx speaker, and a co-founder of 4 companies.</p>	<pre>{ "name": "Sanjiv Singh", "school": "CMU", "research interests": ["autonomous ground vehicles", "autonomous helicopter", "robot perception"] }</pre>

<p>Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science and Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT. Rus's research interests are in robotics, mobile computing, and data science. Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering, and the American Academy for Arts and Science. She earned her PhD in Computer Science from Cornell University.</p>	<pre>{ "name": "Daniela Rus", "school": "MIT", "research interests": ["robotics", "mobile computing", "data science"] }</pre>
<p>Wojciech Matusik is a Professor of Electrical Engineering and Computer Science at the Computer Science and Artificial Intelligence Laboratory at MIT, where he leads the Computational Design and Fabrication Group and is a member of the Computer Graphics Group. Before coming to MIT, he worked at Mitsubishi Electric Research Laboratories, Adobe Systems, and Disney Research Zurich. He studied computer graphics at MIT and received his PhD in 2003. He also received a BS in EECS from the University of California at Berkeley in 1997 and MS in EECS from MIT in 2001. His research interests are in computer graphics, computational design and fabrication, computer vision, robotics, and hci. In 2004, he was named one of the world's top 100 young innovators by MIT's Technology Review Magazine. In 2009, he received the Significant New Researcher Award from ACM Siggraph. In 2012, Matusik received the DARPA Young Faculty Award and he was named a Sloan Research Fellow. In 2014, he received Ruth and Joel Spira Award for Excellence in Teaching.</p>	<pre>{ "name": "Wojciech Matusik", "school": "MIT", "research interests": ["computer graphics", "computational design and fabrication", "computer vision", "robotics", "hci"] }</pre>

(b) Process Description:

To create the dataset, I simply searched up faculty in different institutions. I then randomly selected from the robotics faculty different professors, and searched their names on google and selected descriptions that had the profs name, school, and a brief overview of their work. I specifically chose robotics faculty because I claim in 1c that this can help with selecting professors to contact for graduate studies; since I am applying to a robotics PhD, I wanted to test this claim.

Q3 (1.5 Points). Prompt Styles

(a) Prompt Documentation and Description:

A basic zero-shot prompt as a baseline:

Prompt Structure:

Below is the biography of a professor. Output the name, school, and research interests of the professor in JSON format: {"name": string, "school": string, "research interests": list of strings}.

<Paste Biography>

Output:

Few Shot:

Prompt Structure:

Below is the biography of a professor. Output the name, school, and research interests of the professor in JSON format: {"name": string, "school": string, "research interests": list of strings}.

Example:

Dorsa Sadigh is an assistant professor in Computer Science at Stanford University. Her research interests

lie in the intersection of robotics, machine learning, and human-AI interaction. Specifically, she is interested in developing algorithms that learn robot policies from various sources of data and human feedback, and can seamlessly interact and coordinate with humans. Dorsa received her doctoral degree in Electrical Engineering and Computer Sciences (EECS) from UC Berkeley in 2017, and received her bachelor's degree in EECS from UC Berkeley in 2012. She is awarded the Sloan Fellowship, NSF CAREER, ONR Young Investigator Award, AFOSR Young Investigator Award, DARPA Young Faculty Award, Okawa Foundation Fellowship, MIT TR35, and the IEEE RAS Early Academic Career Award.

Output:

```
{
  "name": "Dorsa Sadigh",
  "school": "Stanford",
  "research interests": ["robotics", "machine learning", "human-AI interaction"]
}
```

<Paste Biography>

Output:

Chain-of-Thought Prompting:

Prompt Structure:

Below is the biography of a professor.

First extract the name and school of the professor.

Then extract the sentences that describe the professor's research.

From this, determine a list of key phrases that best describe the professor's research interests. Finally, output the name, school, and research interests of the professor in JSON format: {"name": string, "school": string, "research interests": list of strings}.

<Paste Biography>

Output:

Q4 (1.5 Points). Results and Discussion

(a) Aggregated results

	Mean Score on Name	Mean Score on Institution	Mean Score on Research Interests
Zero-Shot	1	1	0.867
Few-Shot	1	1	0.867
Chain-of-Thought Prompting	1	1	0.967

(b) Examples of Success and Failure.

I use zero shot prompt, and only include the input data below, not full prompt.

Success: These get full recall.

Input	LLM Output
<p>Martial Hebert is the Director of the Robotics Institute at Carnegie Mellon University. His work is in the areas of computer vision, perception for autonomous systems, and machine learning. Hebert has played a role in such high-profile projects as NavLab, a pioneering program for self-driving vehicles, and in leading the development of perception capabilities for personal care robots in the Quality of Life Technology Center. His research interests include computer vision, especially recognition in images and video data; model building and object recognition from 3-D data; and perception for mobile robots and intelligent vehicles. His group has developed approaches to object recognition and scene analysis in images, 3-D point clouds and video sequences. His most recent work addresses reducing supervision in machine learning through small sample learning techniques.</p>	<pre>{ "name": "Martial Hebert", "school": "Carnegie Mellon University", "research interests": ["computer vision", "perception for autonomous systems", "machine learning", "recognition in images and video data", "model building and object recognition from 3-D data", "perception for mobile robots and intelligent vehicles", "object recognition and scene analysis in images, 3-D point clouds, and video sequences", "reducing supervision in machine learning through small sample learning techniques"] }</pre>
<p>Dr. J. Andrew (Drew) Bagnell is an Assistant Research Professor at Carnegie Mellon University's Robotics Institute and National Robotics Engineering Center (NREC) and is cross-appointed with the Machine Learning Department. His research focuses on machine learning for automated decision making, machine perception, adaptive control, optimization and planning under uncertainty.</p> <p>Some of Dr. Bagnell's key contributions include developing the first reinforcement learning algorithm for helicopter control, developing inverse optimal control methods for imitation learning in both field and legged robotics, and developing machine learning techniques for automated 2D/3D perception and control on programs ranging from commercial driver assistance to autonomous mining.</p> <p>Dr. Bagnell received a B.Sc. in Electrical Engineering with highest honors from the University of Florida in 1998. He joined the Robotics Institute at Carnegie Mellon University in 2000 as a National Science Foundation Graduate Fellow, receiving an MS and PhD in Robotics in 2002 and 2004 respectively.</p> <p>He has spent the last decade working in machine learning and robotics, has over 30 peer-reviewed publications, and regularly serves on the senior program committee and as an associate editor in top conferences and journals in the field.</p>	<pre>{ "name": "Dr. J. Andrew (Drew) Bagnell", "school": "Carnegie Mellon University", "research interests": ["Machine learning for automated decision making", "Machine perception", "Adaptive control", "Optimization and planning under uncertainty"] }</pre>
<p>Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science and Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT. Rus's research interests are in robotics, mobile computing, and data science. Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering, and the American Academy for Arts and Science. She earned her PhD in Computer Science from Cornell University.</p>	<pre>{ "name": "Daniela Rus", "school": "MIT", "research interests": ["robotics", "mobile computing", "data science"] }</pre>

Fail:

The first two are manual fail cases, which break the otherwise correct assumption that the LLM doesn't "make up interests". The last is a real example that shows recall is not always perfect.

Input	LLM Output
Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science and Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT. Rus's research interests are in robotics, mobile computing, and data science. Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering, and the American Academy for Arts and Science. She earned her PhD in Computer Science from Cornell University. Daniela is helping Kyrie Irving on a project around basketball, which is a major research interest for Kyrie only	{ "name": "Daniela Rus", "school": "MIT", "research interests": ["robotics", "mobile computing", "data science", "basketball"] }
Daniela Rus is the Andrew (1956) and Erna Viterbi Professor of Electrical Engineering and Computer Science and Director of the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT. Rus's research interests used to be in robotics, mobile computing, and data science. Now she is interested in robot perception. Rus is a Class of 2002 MacArthur Fellow, a fellow of ACM, AAAI and IEEE, and a member of the National Academy of Engineering, and the American Academy for Arts and Science. She earned her PhD in Computer Science from Cornell University.	{ "name": "Daniela Rus", "school": "MIT", "research interests": ["robot perception", "robotics", "mobile computing", "data science"] }
<p>Below is the biography of a professor. Output the name, school, and research interests of the professor in JSON format: {"name": string, "school": string, "research interests": list of strings}</p> <p>Dr. Sanjiv Singh is an innovator, educator, and entrepreneur. He is currently a Consulting Professor at the Robotics Institute, Carnegie Mellon University and the CEO of Near Earth Autonomy, a start-up that develops autonomy for next-generation aircraft that will inspect infrastructure, deliver cargo, and transport people.</p> <p>Dr. Singh started his career in 1985, working on the first autonomous ground vehicles to operate outdoors. Since then, he has led research and development efforts with applications in aviation, agriculture, mining, and construction. In 2010 he led a team that demonstrated the first autonomous full-scale helicopter capable of take-off, landing zone evaluation, and safe descent. In 2011 he led the autonomy effort for Transformer, DARPA's flying car program. From 2012-2023, he led the perception efforts for ONR's AACUS program that demonstrated high-performance autonomous flight for three classes of rotorcraft. He currently leads several autonomous aerial cargo transport and inspection projects. Dr. Singh obtained his Ph.D. in Robotics at Carnegie Mellon in 1995. He is the founding editor of the Journal of Field Robotics, a TEDx speaker, and a co-founder of 4 companies.</p> <p>Output:</p>	{ "name": "Dr. Sanjiv Singh", "school": "Carnegie Mellon University", "research interests": ["Autonomous ground vehicles", "Autonomy for aircraft", "Aviation applications", "Agricultural applications", "Mining applications", "Construction applications", "Autonomous helicopters", "Autonomous flight systems", "Aerial cargo transport", "Infrastructure inspection"] }

The successful ones succeed because they are straightforward biographies that almost explicitly list out the name, institution and research interests, so it is not hard for the LLM to pick up on them without examples or other context. They do not include anything that could or is meant to confuse the language model.

The first failure case fails because we introduce another person and his interest to the paragraph. The LLM assumes the interest of this person in fact belongs to the person the biography is about, and thus outputs “basketball” as one of Daniela’s interests. The second failure case fails because we add in past research interests, but the LLM seemingly searches just for key words without much interpreting of the terms “used to be”. So, it does not realize robotics, mobile computing, and data science are past interests of Daniela and she is no longer working on them. The third failure case is not an example where the LLM does poorly, but one where it does not get perfect recall, which could be considered poor for LLM standards. It misses the fact that Sanjiv Singh works on perception; which is a key word I would have liked listed. The reason may be because the sentence containing “perception” describes one of his works, and is not clearly listed as an interest.

Q5 (1 Points). Limitations

(a) Deployment Issues:

The first deployment issue is Ambiguity and Contextual Understanding - LLMs often rely on context to generate responses. Research interests might be diverse and multidisciplinary, leading to potential ambiguity; for instance, it might misclassify an interest in "quantum mechanics" as solely a physics interest, neglecting its interdisciplinary connections with computer science or mathematics.

To mitigate this issue, employing post-processing techniques such as keyword analysis, entity recognition, or even manual review by domain experts could help refine and verify the extracted interests. Fine-tuning the model on a specific dataset related to academic research or providing more contextual information might also enhance accuracy.

The second issue is incomplete or insufficient data - sometimes, professor biographies might lack detailed information or could be too concise, making it challenging for the model to accurately extract all research interests. Some professors might have varied interests but only mention a few in their bios, leading to an incomplete representation.

Augmenting the model's training data with more diverse and extensive examples of professor biographies can improve its ability to understand and extract a broader range of research interests. Additionally, integrating external databases or utilizing other sources like academic publications, interviews, or faculty profiles could supplement the model's understanding and fill in any gaps.

Appendix:

5 more examples:

Input	Output
<p>Takeo Kanade, the U.A. and Helen Whitaker University Professor of Robotics and Computer Science at Carnegie Mellon University, received the prestigious 2016 Kyoto Prize for Advanced Technology, Nov. 10, 2016 in a ceremony in Kyoto, Japan.</p> <p>The international award is presented by the Inamori Foundation to individuals such as Kanade who have contributed significantly to the scientific, cultural and spiritual betterment of humankind. Kanade's prize recognizes his pioneering contributions to computer vision and robotics.</p> <p>Dr. Kanade is the U. A. and Helen Whitaker University Professor of Computer Science and Robotics and the director of Quality of Life Technology Engineering Research Center at Carnegie Mellon University. He received his Doctoral degree in Electrical Engineering from Kyoto University, Japan, in 1974. After holding a faculty position in the Department of Information Science, Kyoto University, he joined Carnegie Mellon University in 1980. He was the Director of the Robotics Institute from 1992 to 2001. He also founded the Digital Human Research Center in Tokyo and served as founding director.</p> <p>Dr. Kanade works in multiple areas of robotics: computer vision, multi-media, manipulators, autonomous mobile robots, medical robotics and sensors. He has written more than 400 technical papers and reports in these areas, and holds more than 20 patents. He has been the principal investigator of more than a dozen major vision and robotics projects at Carnegie Mellon.</p> <p>Dr. Kanade's other professional honors include: election to the National Academy of Engineering, the American Academy of Arts and Sciences, a Fellow of IEEE, a Fellow of ACM, and a Fellow of American Association of Artificial Intelligence; several awards including Kyoto Prize, the Benjamin Franklin Institute Medal and Bower Prize, C&C Award, Okawa Award, ACM/AAAI Allen Newell Award, Joseph Engelberger Award, IEEE Robotics and Automation Society Pioneer Award, and ICCV Azriel Rosenfeld Lifetime Accomplishment Award.</p>	<pre>{ "name": "Takeo Kanade", "school": "Carnegie Mellon University", "research interests": ["Computer Vision", "Robotics", "Multi-media", "Manipulators", "Autonomous Mobile Robots", "Medical Robotics", "Sensors"] }</pre>
<p>Howie Choset is a Professor of Robotics at Carnegie Mellon University where he serves as the co-director of the Biorobotics Lab and as director of the Robotics Major. He received his undergraduate degrees in Computer Science and Business from the University of Pennsylvania in 1990. Choset received his Masters and PhD from Caltech in 1991 and 1996. Choset's research group reduces complicated high-dimensional problems found in robotics to low-dimensional simpler ones for design, analysis, and planning. Motivated by applications in confined spaces, Choset has created a comprehensive program in modular, high DOF, and multi-robot systems, which has led to basic research in mechanism design, path planning, motion planning, and estimation. This work has been supported by both industry and government; DOD support includes two MURIs, one of which Choset was the CO-PI, a young investigator award, and multi-PI awards for modular systems. Choset.s group has produced over 60 journal papers (including 2 in Science and one in Proceedings of the National Academies of Science), 180 conference papers and 15 patents. Choset.s work has also been recognized by several best paper awards</p>	<pre>{ "name": "Howie Choset", "school": "Carnegie Mellon University", "research interests": ["Modular robotics", "Multi-robot systems", "Mechanism design", "Path planning", "Motion planning", "Estimation", "Surgery", "Manufacturing", "Infrastructure inspection", "Search and rescue", "Robotics in healthcare", "Autonomous guided vehicles", "Robotics in manufacturing"] }</pre>

<p>and nominations at ICRA, IROS and other robotics meetings. Choset's research program has made contributions to challenging and strategically significant problems in diverse areas such as surgery, manufacturing, infrastructure inspection, and search and rescue. In addition to publications, this work has led to Choset, along with his students, to form several companies including Medrobotics, for surgical systems, Hebi Robotics, for modular robots, and Bito Robotics for autonomous guided vehicles. Recently, Choset's surgical snake robot cleared the FDA and has been in use in the US and Europe since. Choset also leads multi-PI projects centered on manufacturing: (1) automating the programming of robots for auto-body painting; (2) the development of mobile manipulators for agile and flexible fixture-free manufacturing of large structures in aerospace, and (3) the creation of a data-robot ecosystem for rapid manufacturing in the commercial electronics industry. This year, Choset co-lead the formation of the Advanced Robotics for Manufacturing Institute, which is \$250MM national institute advancing both technology development and education for robotics in manufacturing. Finally, Choset is a founding Editor of the journal Science Robotics. and is currently serving on the editorial board of IJRR.</p> <p>In 2002 the MIT Technology Review elected Choset as one of its top 100 innovators in the world under 35. In 2014, Popular Science selected Choset's medical robotics work as the Best of What's New in Health Care. In 2005, MIT Press published a textbook, lead authored by Choset, entitled "Principles of Robot Motion." Finally, Choset's students have won best paper awards at the RIA in 1999 and ICRA in 2003; his group's work has been nominated for best papers at ICRA in 1997, IROS in 2003, 2007, and 2011, and CLAWAR in 2012; won best paper at IEEE Bio Rob in 2006, SSRR 2012 and 2015; won best video at ISMICS 2006 and ICRA 2011; and was nominated for best video in ICRA 2012.</p>	<pre>] }</pre>
<p>Dr. Russ Tedrake is the Vice President of Robotics Research at Toyota Research Institute (TRI). Dr. Tedrake manages a team devoted to producing a world-class simulation capability for TRI with a simple vision: What if we could develop real-world robots and autonomous vehicles completely in software (and trust that they will work in the real world)? Dr. Tedrake's team also pursues fundamental research on "Enabling Technologies" for TRI Robotics, with a specific focus on manipulation and soft robotics.</p> <p>Dr. Tedrake is also the Toyota Professor at the Massachusetts Institute of Technology (MIT) in the Department of Electrical Engineering and Computer Science, Mechanical Engineering, and Aero/Astro, and he is a member of MIT's Computer Science and Artificial Intelligence Lab (CSAIL). He received a B.S.E. in computer engineering from the University of Michigan in 1999 and a Ph.D. in electrical engineering and computer science from MIT in 2004.</p> <p>Dr. Tedrake is the director of the MIT CSAIL Center for Robotics and was the leader of MIT's entry in the DARPA Robotics Challenge. He is a recipient of the NSF CAREER Award, the MIT Jerome Saltzer Award for undergraduate teaching, the DARPA Young Faculty Award in Mathematics, the 2012 Ruth and Joel Spira Teaching Award, and was named a Microsoft Research New Faculty Fellow. His research has been recognized with numerous conference best paper awards, including ICRA, Robotics: Science and Systems, Humanoids, Hybrid Systems: Computation and Control, as well as the inaugural best paper award from the IEEE RAS Technical Committee on Whole-Body Control.</p>	<pre>{ "name": "Russ Tedrake", "school": "MIT", "research interests": ["autonomous vehicles", "manipulation", "soft robotics", "control", "humanoids"] }</pre>
<p>Tomas Lozano-Perez is currently the School of Engineering Professor in Teaching Excellence at the Massachusetts Institute of Technology (MIT), USA, where he is a</p>	<pre>{ "name": "Tomas Lozano-Perez", "school": "MIT",</pre>

<p>member of the Computer Science and Artificial Intelligence Laboratory. He has been Associate Director of the Artificial Intelligence Laboratory and Associate Head for Computer Science of MIT's Department of Electrical Engineering and Computer Science. He was a recipient of the 2021 IEEE Robotics and Automation Award, a 2011 IEEE Robotics Pioneer Award and a 1985 Presidential Young Investigator Award. He is a Fellow of the AAAI, ACM, and IEEE.</p> <p>His research has been in robotics (configuration-space approach to motion planning), computer vision (interpretation-tree approach to object recognition), machine learning (multiple-instance learning), medical imaging (computer-assisted surgery) and computational chemistry (drug activity prediction and protein structure determination from NMR & X-ray data). His current research is aimed at integrating task, motion and decision-theoretic planning for robotic manipulation.</p>	<pre>"research interests": ["motion planning", "computer vision", "machine learning", "medical imaging", "computational chemistry", "task planning", "robotic manipulation"] }</pre>
<p>Vivienne Sze is an associate professor in MIT's Department of Electrical Engineering and Computer Science. Her group works on computing systems that enable energy-efficient machine learning, computer vision, and video compression/processing for a wide range of applications, including autonomous navigation, digital health, and the internet of things. She is widely recognized for her leading work in these areas and has received many awards, including faculty awards from Google, Facebook, and Qualcomm, the Symposium on VLSI Circuits Best Student Paper Award, the IEEE Custom Integrated Circuits Conference Outstanding Invited Paper Award, and the IEEE Micro Top Picks Award. As a member of the Joint Collaborative Team on Video Coding, she received the Primetime Engineering Emmy Award for the development of the High-Efficiency Video Coding video compression standard. She is a co-author of the book entitled "Efficient Processing of Deep Neural Networks".</p>	<pre>{ "name": "Vivienne Sze", "school": "MIT", "research interests": ["energy-efficient machine learning", "energy-efficient computer vision", "energy-efficient video compression/processing", "autonomous navigation", "digital health", "internet of things"] }</pre>
<p>Dr. J. Andrew (Drew) Bagnell is an Assistant Research Professor at Carnegie Mellon University's Robotics Institute and National Robotics Engineering Center (NREC) and is cross-appointed with the Machine Learning Department. His research focuses on machine learning for automated decision making, machine perception, adaptive control, optimization and planning under uncertainty.</p> <p>Some of Dr. Bagnell's key contributions include developing the first reinforcement learning algorithm for helicopter control, developing inverse optimal control methods for imitation learning in both field and legged robotics, and developing machine learning techniques for automated 2D/3D perception and control on programs ranging from commercial driver assistance to autonomous mining.</p> <p>Dr. Bagnell received a B.Sc. in Electrical Engineering with highest honors from the University of Florida in 1998. He joined the Robotics Institute at Carnegie Mellon University in 2000 as a National Science Foundation Graduate Fellow, receiving an MS and PhD in Robotics in 2002 and 2004 respectively.</p> <p>He has spent the last decade working in machine learning and robotics, has over 30 peer-reviewed publications, and regularly serves on the senior program committee and as an associate editor in top conferences and journals in the field.</p>	<pre>{ "name": "J. Andrew Bagnell", "school": "CMU", "research interests": ["machine learning for automated decision making", "machine perception", "adaptive control", "optimization", "planning under uncertainty"] }</pre>

