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Mikhail Jacob

Education

Georgia Institute of Technology, Atlanta, GA, USA.
Ph.D. in Computer Science, Ph.D. Dissertation: "Interactive Learning and Real-time Decision-making for Improvisational Embodied Human-AI Performances", Advisor: Dr. Brian Magerko, July 2019 (expected). GPA – 3.93 / 4.0

Georgia Institute of Technology, Atlanta, GA, USA.
M.S. in Computer Science: Interactive Intelligence, M.S. Project: "Viewpoints AI", Advisor: Dr. Brian Magerko, May 2013. GPA – 4.0 / 4.0

Manipal Institute of Technology, Manipal, India.
B.E. in Computer Science & Engineering, July 2011. GPA – 8.48 / 10.0

Research Experience

Georgia Institute of Technology, Atlanta, GA 05/2018 – Present
EarSketch Co-creative AI, Expressive Machinery Lab (formerly ADAM Lab)
https://expressivemachinery.gatech.edu/projects/earsketch/

- The EarSketch Co-creative AI research project is exploring how autonomous agents can collaborate with students (potentially as peers) on the online Earsketch platform to increase student exploration of ideas, both musically and computationally.
- Researching, designing, and implementing recommendation engine for Earsketch musical samples for students to increase the diversity, novelty, and serendipity of sample usage.

Georgia Institute of Technology, Atlanta, GA 08/2016 - Present
The Robot Improv Circus, Expressive Machinery Lab (formerly ADAM Lab)
https://expressivemachinery.gatech.edu/projects/robot-improv-circus/

- The Robot Improv Circus is a VR installation where non-expert users can play the Props game, i.e. improvise open-ended movement-based vignettes with a virtual character using abstract props. The CARNIVAL (Creative Arc Negotiating Intelligent Virtual Agent pLatform) architecture enables the virtual character to select actions along a given 'creative arc' over the course of the improvised performance evolving the user's experience over time.
- Researching, designing, and implementing intelligent agent architecture for virtual reality environments containing affordance-based deep neural action generation, improvisational reasoning strategies, strategy selection, and evaluative models of creativity.
- ***Awarded a Creative Curricular Initiatives (CCI) grant, two Invited installations, featured on cover of Georgia Institute of Technology Annual Report 2018, and three peer-reviewed publications.***

Georgia Institute of Technology, Atlanta, GA 08/2016 – 05/2018
TuneTable, Expressive Machinery Lab (formerly ADAM Lab)
https://expressivemachinery.gatech.edu/projects/earsketch/

- The TuneTable is a tangible computing museum installation for informal learning of computational thinking concepts using open-ended sample-based music composition.
- Researched, designed, and constructed two iterations of interactive tabletop using computer vision.
- ***Two iterations of TuneTable were installed for field experiments at the Museum of Science and Industry, Chicago with published results pending.***

Georgia Institute of Technology, Atlanta, GA 08/2012 – 08/2017
LuminAI (formerly Viewpoints AI), Expressive Machinery Lab (formerly ADAM Lab)
https://expressivemachinery.gatech.edu/projects/luminai/

- LuminAI (formerly Viewpoints AI) was an installation that explored how to create a truly open-ended human-AI improvisational embodied interaction experience with minimal pre-authored content knowledge for the AI character. Interactive learning techniques, reasoning strategies from human improvisers, and the Viewpoints framework from theatre & dance were used to learn, procedurally represent, and reason about

movement in order to improvise contemporary movement and dance performances with non-expert users.
- Researched, designed, and implemented case-based and imitation learning methods to teach the agent movement improvisation through observation and interaction, as well as procedural reasoning about improvisational response generation within the Soar cognitive architecture.
- ***Field Experiment grant finalist, collaboration with T Lang Dance Company (Atlanta) as hybrid improvised-choreographed dance performance Post, selected to the ACCelerate Festival at the Smithsonian Institution National Museum of American History, numerous national and international invited & peer-reviewed installations, winner of the Neukom Institute Turing Test in Creative Arts 2017: DanceX Prize, and six peer-reviewed publications.***

Georgia Institute of Technology, Atlanta, GA 08/2012 – 08/2016

Computational Representations of Play, Expressive Machinery Lab (formerly ADAM Lab)

https://expressivemachinery.gatech.edu/projects/computational-play/
- The Computational Representations of Play Project studied human cognition during pretend play and used the results to computationally model playful behavior in software agents and robots for playful task execution and pretend play with toys.
- Researched, designed, and implemented conceptual blending of objects for object-based pretense within a toy-based pretend play experience between human and robot (or embodied virtual agent).
- Designed a conceptual cognitive architecture called the Co-creative Cognitive Architecture (CoCoA) extending Soar with an emphasis on co-creativity.
- ***Three peer-reviewed publications***

Georgia Institute of Technology, Atlanta, GA 12/2011 – 08/2012

Digital Improv, Expressive Machinery Lab (formerly ADAM Lab)

https://expressivemachinery.gatech.edu/projects/digital-improv/
- The Digital Improv Project was part of an effort to understand improvisational cognition, enabling humans and agents to co-creatively perform improvisational theatre.
- Researched computational reasoning about status & representation of character status in improv theatre
- Researched, designed, and implemented workflow / process for using crowd-sourcing to collect data for constructing cognitive scripts for improv theatre.

Publications

1. Jacob, M. & Magerko, B. (2018). “Creative Arcs in Improvised Human Computer Embodied Performances.” In the *Proceedings of the 1st Curiosity in Games Workshop at the International Conference on the Foundations of Digital Games (FDG) 2018*. Malmö, Sweden.
2. Jacob, M. (2017). “Towards Lifelong Interactive Learning for Open-ended Embodied Co-creative Narrative Improvisation.” In the *Proceedings of the Doctoral Consortium at the Eighth International Conference on Computational Creativity (ICCC)* 2017, Atlanta, GA USA.
3. Long, D., Jacob, M., Davis, N., and Magerko, B. (2017). “Designing for Socially Interactive Systems.” In the *Proceedings of the 11th Conference on Creativity and Cognition (C&C)* 2017, Singapore.
4. Jacob, M. (2017). “Towards Lifelong Interactive Learning for Open-ended Embodied Narrative Improvisation.” In the *Proceedings of the Graduate Student Symposium at the 11th Conference on Creativity and Cognition (C&C)* 2017, Singapore.
5. Singh, K.Y., Davis, N., Hsiao, C.-P., Jacob, M., Patel, K., Magerko, B. (2016). “Recognizing Actions in Motion Trajectories using Deep Neural Networks.” In the *Proceedings of the 12th Conference on Artificial Intelligence and Interactive Digital Entertainment* (AIIDE) 2016, Burlingame, CA USA.
6. Jacob, M. & Magerko, B. (2015). “Interaction-based Authoring for Scalable Co-creative Agents.” In the *Proceedings of the 6th International Conference on Computational Creativity (ICCC)* 2015, Provo, UT.
7. Davis, N., Comerford, M., Jacob, M., Hsiao, C.-P., & Magerko, B. (2015). “An Enactive Characterization of Pretend Play.” In the *Proceedings of the 10th ACM conference on Creativity and Cognition (C&C)* 2015. Glasgow.
8. Jacob, M. & Magerko, B. (2015). “Viewpoints AI.” In the *Proceedings of the Artwork Exhibition at the 10th ACM conference on Creativity and Cognition (C&C)* 2015. Glasgow, Scotland.

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9. Magerko B., Permar, J., Jacob, M., Comerford, M., and Smith, J. (2014). "An Overview of Computational Co-creative Pretend Play with a Human." In the *Proceedings of the 1st Workshop on Playful Virtual Characters at the 14th Annual Conference on Intelligent Virtual Agents (IVA) 2014*, Boston, MA USA.
10. Jacob, M., Coisne, G., Gupta, A., Sysoev, I., Verma, G., and Magerko, B. (2013). "Viewpoints AI." In the *Proceedings of the 9th Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE) 2013*, Boston, MA USA.
11. Jacob, M., Coisne, G., Gupta, A., Sysoev, I., Verma, G., and Magerko, B. (2013). "Viewpoints AI: Demonstration." In the *Proceedings of the 9th Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE) 2013*, Boston, MA USA.
12. Jacob, M., Zook, A., and Magerko, B. (2013). "Viewpoints AI: Procedural Representation and Reasoning on Gesture Meaning." In the *Proceedings of the Digital Games Research Association (DiGRA) 2013*, Atlanta, GA USA.

Presentations

- Jacob, M., Douglas, L., & Sawant, T. (2018). "The Robot Improv Circus", *The Biltmore House,* Atlanta, GA USA. *Invited installation,* Presented 09/10-14/18.
- Jacob, M., Down, R., Lacy, D., Wong, K., & Yang, W. (2018). "The Robot Improv Circus", *TechRec at the Georgia Tech Student Center, Georgia Institute of Technology,* Atlanta, GA USA. *Invited Installation.* Presented 07/23, 24, & 27/18.
- Long, D., Jacob, M., & Magerko, B. (2017). "LuminAI", *ACCelerate Creativity and Innovation Festival 2017 at the National Museum of American History, Smithsonian Institution*, Washington DC, *Finalist selection and museum installation*. Presented 10/13-15/17.
- Jacob, M. (2017). "Introduction To Kinect Programming Workshop", *Technology Arts Practicum graduate course, Georgia Institute of Technology,* Atlanta, GA USA. *Invited workshop.* Presented 09/13/16.
- Jacob, M., Winston, L., Viriyayuthakorn, S., & Magerko, B. (2016). "LuminAI", *Digital Media Showcase, EyeDrum Gallery,* Atlanta, GA USA. *invited performance and gallery installation.* Presented 04/29/16-05/01/16.
- Jacob, M., Anderson, J., Winston, L., Viriyayuthakorn, S., & Magerko, B. (2016). "LuminAI", The *Goat Farm Arts Center,* Atlanta, GA USA. *Hambidge Art Auction*, *Field Experiment grant finalist, invited performance, and gallery installation.* Presented 04/23-30/16.
- Jacob, M., Anderson, J., Winston, L., Viriyayuthakorn, S., & Magerko, B. (2015). "Viewpoints AI", *STEAM³ Conference, Georgia State University,* Atlanta, GA USA. *Invited installation.* Presented 09/11-13/15.
- Jacob, M., Anderson, T., Tsai, A., & Magerko, B. (2014). "Viewpoints AI", *Georgia Tech TechArts Festival, Georgia Institute of Technology,* Atlanta, GA USA. *Invited installation.* Presented 02/18/15.
- Jacob, M. (2013). "Once More With Feeling: Cognitive Models of Emotion", *AI Storytelling in Virtual Worlds graduate course, Georgia Institute of Technology,* Atlanta, GA. *Invited lecture*, Presented 10/03/14.
- Jacob, M. (2013). "Intro to Planning and Narrative", *AI Storytelling in Virtual Worlds graduate course, Georgia Institute of Technology,* Atlanta, GA. *Invited lecture*, Presented 08/27, 29/14.
- Jacob, M. & Magerko, B. (2014). "Viewpoints AI", *Seventh International Conference on Interactive Digital Storytelling (ICIDS), ArtScience Museum*, Singapore. *Peer-reviewed installation*. Presented 11/2-5/14.
- Jacob, M. (2014). "Computational Representations of Pretend Play." *34th Soar Workshop*, Ann Arbor, MI. *Peer-reviewed talk*. Presented 06/18/14.
- Jacob, M. (2014). "Viewpoints AI – Improvisational Dance / Contemporary Movement AI." *34th Soar Workshop*, Ann Arbor, MI. Presented 06/18/14.
- Jacob, M., Sysoev, I., Anderson, T., & Magerko, B. (2014). "Viewpoints AI", *Georgia Tech TechArts Festival, Georgia Institute of Technology,* Atlanta, GA USA. *Invited installation.* Presented 02/24-25/14.
- Jacob, M., Sysoev, I., & Magerko, B. (2013). "Viewpoints AI", *The DAEL Windows Project,* Atlanta GA USA. *Invited installation* Presented 12/1-31/13.
- Jacob, M. (2013). "Viewpoints AI", *Computational Creativity Club at First PROSECCO Autumn School on*

Computational Creativity, Porvoo, Finland. *Peer-reviewed demonstration*. Presented 11/20/13.

- Jacob, M. (2013). "Viewpoints AI", *Georgia Game Developers Association Meeting,* Atlanta, GA USA. *Invited performance*. Presented 11/12/13.
- Jacob, M. (2013). "Viewpoints AI", *Interactive Narrative graduate course*, *Georgia Institute of Technology,* Atlanta. GA USA. *Invited lecture.* Presented 10/20/13.
- Jacob, M., Coisne, G., Gupta, A., Sysoev, I., Verma, G., & Magerko, B. (2013). "Viewpoints AI." *Ninth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE),* Boston, MA USA. *Peer-reviewed demonstration.* Presented 10/17/13.
- Jacob, M. (2013). "Computational Play.", *GVU Brown Bag Seminar: GVU Research and Innovation Grants Talks*, *Georgia Institute of Technology,* Atlanta, GA USA. *Invited Talk.* Presented 04/11/13.

Teaching

Teaching Assistant, Fall 2017, Computational Aesthetics (CS 8803 CA + CS 4803 CA). Overall Effectiveness: 4.75/5.0

- Project-based course on developing computational models for evaluating aesthetics, value, and quality in different creative domains like motion, animation, color, dance, music, and visual art.
- Collaborated with primary instructor throughout course on topic selection and lesson plan development (lecture preparation, assignment design, evaluation design, etc.).
- Primarily student project mentorship, supplementary instruction (during office hours), and grading.
- Closely related to dissertation research components on computationally evaluating creativity and created opportunities for connecting that research to other creative domains
- Selected student evaluation quotes:
  - *"He is very good and also helps if required"*
  - *"The TA was good. I enjoyed taking the course."*
  - *"Perfect TA for the course."*
  - *"He is kind and really helpful :)"*

Teaching Assistant, Fall 2014, AI Storytelling in Virtual Worlds (CS 7634 + CS 4803 + LMC 8803 MR). Overall Effectiveness: 4.83/5.0

- Project-based course on studying academic game AI, interactive narrative, believable virtual characters, story generation, narrative planning, etc.
- Conducted two guest lectures in class on automated planning and computational models of affect.
- Primarily student project mentorship, supplementary instruction (during office hours), and grading.
- Closely related to dissertation research topic of agent architectures for game AI and interactive narrative, but not necessarily improvisational narratives.
- Selected student evaluation quotes:
  - *"He gave back grades pretty quickly, and he was very informative in the comments on assignments"*
  - *"Very approachable. The class would basically corner him after class if they needed any help and Mikhail was always ready to answer any doubts we had."*
  - *"Brilliant TA. Definitely the best TA I've had in Tech yet."*

Teaching Assistant, Spring 2013, Expressive AI (CS 8803-EAI).

- Project-based course on studying how academic AI techniques can be applied to expressive media, arts, and other creative domains.
- Led several class discussions (substituting for primary instructor).
- Primarily managing and coordinating course project and supplementary instruction (during office hours). Collaborated with primary instructor on grading.
- Closely related to research on agent architectures for expressive media, arts, and other creative domains.

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Awards & Honors

- The Robot Improv Circus (formerly Movement Improvisation Environment/MImE): Creative Curricular Initiatives Arts Fellow – Spring 2018. Office of the Arts, Georgia Institute of Technology. January 2018.
- LuminAI: ACCelerate Creativity and Innovation Festival 2017 official selection, Smithsonian Institution & Virginia Institute of Technology. October 2017.
- LuminAI: 1st place winner at the Turing Test in Creative Arts 2017 competition – DanceX category. Neukom Institute, Dartmouth College. June 2017.
- LuminAI: Finalist and exhibition selection for Field Experiment Atlanta Grant, The Goat Farm Arts Center. March 2016.

Grant Proposals

- Awarded: Creative Curricular Initiatives (CCI), Office of the Arts, Georgia Institute of Technology. January 2018. “Movement Improv Environment (MImE)”. Amount: USD 6,000. Role: PI
- Submitted: NSF Medium Proposal, Mind, Machine, and Motor Nexus (M3X), National Science Foundation. January 2018. “Participatory Sense-making with Embodied Co-Creative Agents”. Role: Co-author
- Submitted: NSF Small Proposal, Cyber-Human Systems (CHS), National Science Foundation. October 2016. “Learning Improvisational Behaviors for Embodied Interactions with Intelligent Agents in Open-ended Domains”. Role: Primary author

Institutional Service

- Local Chair for International Conference on Computational Creativity (ICCC) 2017, Atlanta GA.
- Head of Graduate Student Council Travel Funding Committee 2015 - 2018
- Member of Graduate Student Council Travel Funding Committee 2013 - 2015
- Program Committee member for the following venues:
    - ACC International Conference on Computational Creativity (ICCC) 2017 - 2018
    - AAAI Artificial Intelligence in Interactive Digital Entertainment (AIIDE) 2016 - 2018
    - IEEE Computational Intelligence in Games (CIG) 2016 - 2018
    - Computational Creativity & Games Workshop (CCGW) 2015 - 2017
    - International Symposium on Electronic Art (ISEA) 2017

Professional Affiliations

- Association for the Advancement of Artificial Intelligence (AAAI)
- Cognitive Science Society (CogSci)
- Association for Computing Machinery (ACM)
    - Special Interest Group on Artificial Intelligence (SIGAI)
- Institute of Electrical and Electronics Engineers (IEEE)

Educational Travel

- Singapore. ACM SIGCHI Conference on Creativity and Cognition 2017 Graduate Student Symposium. Travel grant.
- Porvoo, Finland. Autumn School on Computational Creativity 2013. PROSECCO grant.
- Reykjavik, Iceland. Summer School on Artificial General Intelligence 2012. HUMANOBS grant.

Curricular Projects

Ubiquitous Computing, Summer 2018:

"*Effect of Audience Participation on VR Installation User Experience*"

- Designed and conducted a study to evaluate the effect of audience participation on the user experience of users within the Robot Improv Circus VR installation. Results showed highly positive ratings for user experiences within the installation, but no significant results for the presence of an audience participation effect on of the dimensions of user experience under study.

Technology Arts Practicum, Fall 2016:

"*Interactive Phantasmagorical Ephemera*"

- Researched and designed an interactive art installation where participants blow and play with projection mapped vapor-filled bubbles that show abstract imagery of trapped djinn within the bubbles escaping when they pop.

"*Technicolor Oobleck Aliens*"

- Researched and implemented an interactive art installation, where participants whispered secrets to an organic alien entity made out of oobleck on a speaker coil that responded to the sentiment of their speech by varying the sonic parameters of the speaker coil. The alien entity would also change color dynamically when an overhead Kinect sensed the tendrils of oobleck disturbing a virtual paint mixing fluid simulation above it that was then projection mapped and projected down onto the tendrils of oobleck.

"*Chain of Emotion*"

- Researched and implemented an interactive art installation, where participants inside networked booths were shown either emotionally provocative video clips (positive or negative) or a magnified version of participant's facial expression close up to model social contagion of emotion. The capture of participant reactions to the video clips and other participants' expressions was timed by constantly monitoring their expression in real-time and choosing periods of unusually high arousal and valence.

Computational Aesthetics, Fall 2015:

"*Loopy Marionette Dancer*"

- Researched and implemented a tool for creating looped tonal music on turntables with a computational model of novelty, quality, and surprise for the generated music that was visualized using a dancing marionette.

"*An Ecological A-Life Music Generation Tool*"

- Researched and implemented an interactive art installation for the embodied creation and generation of music using a garden or ecosystem of A-Life simulations (Conway's Game of Life, Langton Ants, and Boids) that the human tended as a metaphor for human ecological impact.

"*Aesthetic Color Scheme Generation Tool*"

- Researched and implemented an interactive tool for the aesthetically pleasing generation of color schemes using shapes and trajectories through the LCH color space.

"*Visual Pattern Creation Tool*"

- Researched and implemented a sketch-based pattern creation and beautification tool.

Expressive AI, Fall 2012 – Fall 2013:

"*Viewpoints AI*"

- Viewpoints AI is a human – AI co-creative improvisational movement-based performance piece that procedurally reasons about the current improvised performance using the Viewpoints framework from theatre and dance.
- Researched and implemented the reasoning module of the agent in SOAR that took in viewpoints data and the human performer's gesture and decided how to respond and what to respond with.

Advanced Game AI, Fall 2012:

"*Flame Warz – A Twitter Conflict Game*"

- Researched and implemented a procedurally generated game that mined characters and items from twitter using people that were trending on twitter, their 'friends', and items that they liked in quest templates.
- Mined characters and items used in open-world game where the villain's emotion model, combining plan appraisals from EMA and PAD Space Moods from ALMA, controlled the game ending allowing individual conflict resolution styles like diplomacy, aggression, shaming, etc.

Design of Environments, Spring 2012:

"*SoundBored – Music Therapy For Stroke Rehabilitation*"

- Designed and implemented Microsoft Surface application for stroke survivor rehabilitation using music therapy.
- Users were trained to play increasingly complex generated musical patterns or familiar songs on the device using dynamic difficulty adjustment.

"*SmarTiles*"

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- Designed intelligent floor tiles that could dynamically change from hard to soft in order to absorb impact using camera-based fall detection for trauma prevention in aging adults.

Game AI, Spring 2012:

"*Generative Abstract Art Game*"

- Designed and implemented Unity-based procedurally generated platformer game that generated an abstract art piece using a genetic algorithm and principles of art for fitness evaluation.
- Elements of game level were visual elements of the art piece.
- Game mechanics were generated with evolving parameters and behavior using simple player modeling.

"*Rhythm-based Level Generation for Infinite Mario*"

- Designed and implemented Mario level generator based on user selected music in MIDI format.
- Level elements generated to visualize musical elements such as pitch and instrumentation choice.
- Players were modeled according to Bartle personalities and the aspect of the game they were most interested in was customized according to a linear closed loop player model.

"*Infinite Mario Coin Collecting AI and Custom Personality*"

- Designed and implemented A* agents based on Robin Baumgartner's A* Agent for Infinite Mario game with task of collecting all coins with a custom schizophrenic personality

AI Storytelling In Virtual Worlds, Fall 2011:

"*RadVenture*"

- Designed and implemented AI generated / controlled Alternate Reality Game (ARG) Engine with quest generation & quest management using Hierarchical Task Network (HTN) planning

Design Game, Fall 2011:

"*Evolution!*"

- Designed and implemented full-body exergame using the Kinect to teach concepts of Evolution through two player fighting game between human-controlled species that would evolve according to style of play, survival, and strategies used in fighting

Knowledge Based AI, Fall 2011:

"*Agent To Solve Raven's Progressive Matrices Propositionally*"

- Designed and implemented agent that used abductive & analogical reasoning approach to solve advanced Raven's Progressive Matrices (RPM) problems propositionally and simpler RPM problems visually

"*Agent To Solve Miller Analogies Intelligence Test (MAT)*"

- Designed and implemented agent that used analogical reasoning approach to solve MAT problems propositionally

"*IDEAS - Intelligence Development Employing Archetypical Scripts*"

- Designed architecture and high level algorithm for intelligence development agent that would process streams of events and detect & predict noteworthy larger narrative patterns like terrorist plots, gang wars, etc. using scripts

Other Relevant Courses:

Deep Learning.AI: Deep Learning Specialization (Neural Networks and Deep Learning, Improving Deep Neural Networks, Structuring Machine Learning Projects, Convolutional Neural Networks, Sequence Models); Georgia Institute of Technology (Cognitive Psychology, Introduction to Cognitive Science, Computing Creativity & Design Cognition, Introduction to Robotics Research); and Manipal Institute of Technology (Artificial Intelligence, Artificial Neural Networks).

Skills

Programming Languages – Java, C#, Python, C, C++, JavaScript

Competencies – Unity3D, Game Development, Game AI, Embodied Interactive Narrative, Deep Learning, TensorFlow, Unity ML Agents, Interactive Machine Learning, Generative Models (VAEs & GANs), Case-based Reasoning, Imitation Learning, Automated Planning, Interactive Art Experiences, Co-creative Virtual Agents, Virtual Reality Experiences, Cognitive Modeling in Soar, Cognitive Architectures, Computational Models of Affect, Kinect Development, and Leap Motion Development.

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Work Experience

Georgia Institute of Technology – Atlanta, USA 05/05/2012 - Present
http://expressivemachinery.gatech.edu
Graduate Research Assistant (GRA) – Adaptive Digital Media (ADAM) Lab
- Researched, designed, and developed human-centered AI systems in the domains of improvisational theatre (through gesture and object-based interactions), contemporary movement improvisation, sample-based music composition, and object-based pretend play.
- Currently working on Earsketch Co-creative AI research project for GRA (see Research Experience above).

Institute for Creative Technologies – Los Angeles, USA 05/19/2015 – 08/11/2015
http://cogarch.ict.usc.edu/
Visiting Research Assistant – Sigma Project
- Researched, designed, and integrated appraisal models with the graphical Sigma cognitive architecture in order to improve performance in collaboration with Dr. Paul Rosenbloom.

Citrix R&D India Ltd – Bangalore, India 01/05/2011 - 06/21/2011
http://www.citrix.com/netscaler
Intern Software Development Engineer - Manageability Team, Citrix NetScaler
- Researched, designed, and developed new NetScaler monitoring interface.
- Developed part of NetScaler JavaScript configuration utility replacing current Java implementation.

Microsoft India Development Center – Hyderabad, India 05/31/2010 - 07/30/2010
http://www.microsoft.com/india/msidc/servertools/rds.aspx
Intern Software Development Engineer - Remote Desktop - Virtualization Team
- Researched requirements for transition of from existing Windows Server management API to new version, did feasibility study for adopting new API, and implemented prototype of product using new API to demonstrate feasibility.