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Jesse Lingeman

Education

2008–present **MS, Computer Science (expected 2011)**, *Courant Institute of Mathematical Sciences at New York University*, *New York, NY*.

2005–2008 **BA, Political Science**, *Western Michigan University*, *Kalamazoo, MI*.

Master's thesis

title *Gene Expression Network Analysis and Workflow Software with Instructional Text*

supervisors Dennis Shasha, Richard Bonneau

description Data providence, experimental repeatability, and algorithm input/output fragmentation are all for an experimenting bioinformatician. There exist many datasets in many formats, and many algorithms, each with their own ways of formatting their input and presenting their output. This can make comparison of output between algorithms a tedious, tricky task. This thesis provides a framework to bridge those gaps, creating an easy to use, extensible, and user friendly interface for exploring gene regulatory networks. Several of the best algorithms from the literature were selected, and the software will suggest which algorithm to use based on the data. It also makes it simple to pipeline algorithms, and to compare different algorithm's output to each other by providing a standardized framework for exploring output. By keeping track of every data manipulation, this software makes it easy to repeat and tweak experiments. The second component of this thesis is a monograph that covers the theoretical and practical intuitions behind each algorithm in the software, allowing beginning bioinformaticians to quickly understand why algorithms work the way they do, and what assumptions are being made about the data.

Research Experience

2010-Present **Volunteer Researcher**, *Plant Genomics Lab at NYU*.
- Developed genetic algorithms that use high performance cluster computing to find optimal hyperparameters for solving gene regulatory networks. Continuing work involves gene clustering and analysis of regulatory networks using replica knockout.
- Supervised by Dennis Shasha and Arthur Goldberg

2009-Present **Research Scientist**, *Infant Action Lab at NYU*.
- Research includes the study of the development of reaching in human and non-human primates, the study of the development of walking in infants, and studying how children and adults learn novel forms of locomotion by brachiating over monkey bars. Over the course of the research, I've also written many tools for use in the lab, including the OpenSHAPA Ruby API that allows scripted interactions with video coded data, and several data analysis tools. Ongoing work includes using motion tracking and video tracking software to study the development of locomotion and reaching.
- Supervised by Karen E. Adolph

2009-2010 **Independent Study**, *Columbia University College of Physicians and Surgeons*.
- Using Support Vector Machines and Hidden Markov Models, created evaluation software to calculate flight path deviation for use when training surgeons on the DaVinci Laparoscopic Surgical Robot.
- Supervised by Yann LeCun and Scott Belsley

Manuscripts in Preparation

Whitney G Cole, Jesse M Lingeman, Meghana Komati, and Karen E Adolph. Go naked: Effects of diapers on infant walking. *In preparation.*

Jesse M Lingeman, Kasey C Soska, Karen E Adolph, Kirsten Rosander, Klaus VonHofsten, and Lynne Kiorpes. Visually guided reaching: Parallels between human and non-human primates. *In preparation.*

Piotr Mirowski, Yann LeCun, Jesse M Lingeman, and Dennis Shasha. Dynamic factor graphs for inferring hidden transcriptional variables. *In preparation.*

Papers Presented

Lynne Kiorpes, Gardiner von Trapp, Amelie Pham, Jesse M Lingeman, Kasey Soska, Karen Adolph, Claes von Hofsten, and Kerstin Rosander. Developmental studies of visual-motor integration: A comparative approach. *Vision Science Studies*, 2010.

Posters Presented

Whitney G Cole, Meghana Komati, Megan McGwier, Jesse M Lingeman, and Karen Adolph. Walking skill but not walking experience predicts spontaneous walking in infants. *To be presented at the meeting of the Society for Research in Child Development*, April 2011.

Whitney G Cole, Jesse M Lingeman, Gladys Chan, Elizabeth Quon, Danielle Bendicksen, Beatrix Vereijken, and Karen Adolph. Monkeying around: Development of human brachiation. *To be presented at the meeting of the Society for Research in Child Development*, April 2011.

Meghana Komati, Samira Iravani, Megan McGwier, Jesse M Lingeman, Whitney G Cole, and Karen Adolph. Walk this way: Developmental changes in spontaneous walking. *To be presented at the meeting of the Society for Research in Child Development*, April 2011.

Whitney G Cole, Jesse M Lingeman, Meghana Komati, and Karen Adolph. Go naked: Effects of diapers on infant walking. *International Society of Developmental Psychology*, November 2010.

Meghana Komati, Samira Iravani, Megan McGwier, Jesse M Lingeman, Whitney G Cole, and Karen Adolph. Step by step: Development changes in spontaneous walking. *International Society of Developmental Psychology*, November 2010.

Jesse M Lingeman, Amelie Pham, Kasey Soska, Karen Adolph, Kerstin Rosander, Claes von Hofsten, and Lynne Kiorpes. Visually guided reaching: Parallels between human and non-human primates. *International Society of Developmental Psychology*, November 2010.

Avinash Burra, Jesse M Lingeman, Kuri Gill, and Scott Belsley. Hidden markov models and identification of surgical flight-path deviation with the davinci robot. *Society of American Gastrointestinal and Endoscopic Surgeons*, 2009.

Awards

Sackler Institute and Wiley Travel Award, 2010.

Software Developed

2010 **Distributed Parameter Finder**, *Bioinformatics hyper-parameter finding software*.
- Software developed with Dennis Shasha in the Virtual Plant Lab at NYU. Some bioinformatics algorithms are highly dependent on correct selection of many hyper-parameters, which many times are specific to a certain dataset. This software packages automates the process of finding good values for these parameters by launching the algorithm on a computing cluster with a spread of parameters, analyzes the results, and fine tunes its estimation.

2010 **Movement Grid Visualizer**, *Data visualization tool*.
- This is a tool for generating visualizations of movement of a subject walking through a room that is broken into grid squares. The grid square that the subject is in at any given time is coded from video, and then this tool creates a visualization to help analyze the path that the subject took.

2010 **OpenSHAPA Scripting API**, *Data interaction software*.
- The OpenSHAPA API had the requirement of being an API for non-programmers, so the API completely abstracts away all of the internal database structures in favor of easier to work with Ruby objects. The Ruby objects generate their methods at runtime so each database object is customized to the users' data. Many helper functions to perform common tasks when video coding, such as creating a coding pass for inter-rater reliability, are handled automatically. Cycling through multiple database files and editing many files from within a single script are also supported.

2010 **GaitCrunch**, *Data analysis tool*.
- GaitCrunch is software that was written to solve some of the limitations of the software that is included with the popular GaitRite walking measurement carpet. The software stores all objects in an internal database, calculates walking parameters more accurately than the original software, and offers a variety of exporting formats.

2010 **MonkeyCrunch**, *Data analysis tool*.
- MonkeyCrunch was written to take in manually coded video data of humans brachiating on monkey bars and automatically calculate parameters such as the strategy used for each hand that contacted a bar, timing measures, and cumulative measures such as total number of contacts per strategy.

2010 **Roomba Vision Software**, *Robotics platform*.
- Using the open source library OpenCV, I developed software for use with an iRobot Roomba that has two webcams mounted on top of it. The software will track objects in the view and cause the robot to interact with the objects based on an inferred object type. Using the two webcams to compute a stereo image, depth markers are also estimated so the robot can automatically find a path through a room.

References

Dr. Karen E. Adolph, *Dept. of Psychology, New York University*.
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Dr. Dennis Shasha, *Dept. of Computer Science, New York University*.
Professor and master's thesis advisor at NYU
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Dr. Arthur Goldberg, *Dept. of Computational Biology, Memorial Sloan-Kettering Cancer Center*.
Independent study advisor
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Dr. Robert Trenary, *Dept. of Computer Science, Western Michigan University*.
Professor and undergraduate advisor at Western Michigan University
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