

Joshua Jacobs, Ph.D.

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PERSONAL STATEMENT

I am an applied mathematician with a passion for data science, 3D visualization, mentorship, and team building. I believe in creating value through building effective professional relationships in a project-focused manner.

SKILLS

Analysis: Mathematical Modeling, Probability Models, Statistics, Algorithms, Object Oriented Design

Programming Languages: Python, Java, Fortran 77/90, C/C++/C#, PHP, SQL, R

Tools: TensorFlow, MATLAB, SGE, Git, Eclipse, VTK, 3D Slicer, ParaView, Unity 3D, AWS, MySQL

Interpersonal: Project Management, Team Coordination, Business Analytics

EDUCATION

PhD in Applied Mathematics, University of Washington, Seattle, WA

August 2012

Dissertation: Vortex Dynamics of Geostrophically Adjusted Density Perturbations in Incompressible Fluids

MA in Applied Mathematics, University of Minnesota, Duluth, MN

June 2005

WORK EXPERIENCE

Informatics Specialist II

April 2015 - Present

Department of Neurological Surgery, Mayo Clinic, Rochester, MN

April 2017 - Present

- Departmental data scientist.
- Consulted on and managed multiple interdisciplinary (e.g. Radiology, Pathology, Metabolomics, Genomics, Informatics, etc.) projects related to neurological disorders.
 - Automated acquisition of FitBit data from API (Python) to quantify recovery for spine surgery patients.
 - Designed and implemented experiments analyzing mouse and human neuroimaging (Slicer, Python).
 - Acquired and adapted techniques for genetic analysis of neurological tissues (GSEA, bioconductor, R).
 - Collaborated across interdisciplinary teams to develop a \$1/2 M neurosurgical clinical registry, addressing an 8 month gap in patient reported outcomes with a \$1,000 solution.
 - Prepared neurological data for [visualization](#) in a virtual reality environment (3D Slicer, Unity 3D).
 - Mentoring PhD student on a project of Deep Learning (TensorFlow, NiftyNet) applied to neuroimaging.
- Utilized effective networking resulting in grant pairings (of P.I.s), institutional committee meetings, and interdisciplinary collaborations.

[Neural Engineering Lab](#), Mayo Clinic, Rochester, MN

August 2016 - April 2017

- Created web-application access to 10k research data files pertaining to deep brain stimulation, trajectory planning, and neurotransmitter detection (Python, Django) for a \$12M translational research program.
- Developed a data analysis pipeline to deconvolve complex electrochemical signals for the analysis of material properties on hundreds of boron-doped diamond electrodes.
- Rapidly prototyped (2 weeks) stereotactic surgical planning software in the 3D Slicer framework (Python) used for deep brain stimulation research.

[Precision Neurotherapeutics Lab](#), Mayo Clinic, Phoenix, AZ

April 2015 to August 2016

- Negotiated with multiple sites and through appropriate committees to grant secure access to clinical imaging.
- Designed and deployed AGILE development cycle on cloud-distributed (AWS) tumor segmentation software (Python) to support a \$4M+ research program with 30+ users.
- Executed, analyzed, and [visualized](#) brain cancer models for submission to journals and conferences.

Research Scientist III

March 2012 - April 2015

Kristin Swanson Lab, University of Washington, Seattle, WA; Northwestern University, Chicago, IL

- Maintained, automated, and integrated applications (Java, JavaScript, PHP, Python, Matlab) turning clinical scans into patient-specific, high-performance, mathematical models of brain tumors.
- Developed a Differential Equation model for cerebral radiotracer uptake by hypoxic tumor cell populations.

Department of Mathematics and Statistics, University of Minnesota, Duluth MN,

- Delivered courses in algebra, pre-calculus, and business mathematics utilizing programming expertise (C++), mathematical knowledge, and classroom management.

Contract Programming

1996 - 2003

Provided service to diverse clients in Winona, MN using object oriented design and database application programming in ColdFusion, Object Pascale, MS Access, and Visual Basic. Clients included:

Riverwise Inc., Badger Foundry, Omni Engineering Services Inc., Alumnae Association of CST

PUBLICATIONS

“Improved Model Prediction of Glioma Growth Utilizing Tissue-Specific Boundary Effects” 2018
Joshua Jacobs, Russel Rockne, Andrea Hawkins-Daarud, Sandra Johnston, Pamela Jackson, Kristin Swanson, *Mathematical Biosciences*.

“Mathematical model of perineural tumor spread: a pilot study” December 2017
Joshua Jacobs, Stepan Capek, Robert Spinner, Kristin Swanson, *Acta Neurochirurgica*.

“A patient-specific computational model of hypoxia-modulated radiation-resistance in glioblastoma using 18F-FMISO PET” December 2014
 R. Rockne, M. Neal, A. D. Trister, **J. Jacobs**, A. Hawkins-Daarud, J. K. Rockhill, M. Mrugala, P. Kinahan, K.A. Krohn, K. Hendrickson, K.R. Swanson, The Royal Society Interface (December 2014), DOI: 10.1098/rsif.2014.1174.

“Geometry Playground” September 2010
 Heath, Daniel and **Joshua Jacobs**, Loci (September 2010), DOI: 10.4169/loci003567.

“Prediction of Hypoxic Fraction by Patient-Specific Models of Glioblastoma Multiforme” In Preparation
Joshua Jacobs, Russ Rockne, Andrea Hawkins-Daarud, Pam Jackson, Robert Harrison, Paul Kinahan, Kristin Swanson.

ABSTRACTS

“Mathematically Modeling Perineural Spread Along Peripheral Nerves” November 2016
J Jacobs, S Capek, R Spinner, K Swanson Society of NeuroOncology Annual Meeting; Scottsdale AZ

“Simulating patterns of recurrence following ischemia in brain tumors” November 2016
 L Curtin, A Hawkins-Daruud, A Porter, **J Jacobs**, M Owen, K vander Zee, R Aoun, B Bendok, K Swanson Society of NeuroOncology Annual Meeting; Scottsdale AZ.

SOFTWARE DEVELOPED

CLAWPACK(FORTRAN, Python) April 2011
 Contributed NetCDF/Silo file I/O.

“For studying the definition of the derivative” and “Riemann Sums”(Java) May 2010
 Written with Dr. D.J. Heath, PLU, and purchased by Plato Learning.

Geometry Playground(Java) January 2010
 An Open-Source, object-oriented, educational software developed with AGILE principles with [Dr. Daniel Heath](#).

Awards and Services

Member of Mayo Clinic Data Science Program Mayo Clinic 2017-2018
Track Lead for Mayo Clinic Machine Learning/Deep Learning Club Mayo Clinic 2016-2018
Neurological Surgery Enterprise Research Committee Mayo Clinic 2015-2017
Team Science Award Mayo Clinic Neural Engineering Lab 2015
Chapter President of Society for Industrial and Applied Mathematics University of Washington 2008-2009

Volunteering

Saint Matthais School Men’s Club Chicago, IL 2013-2015
Rochester Meditation Center Rochester, MN 2015-Present

Hobbies

Tai Ji, Backpacking, Bicycling, Wood Turning, Deep Learning in Art.