# Jeremy Binagia

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## ABOUT ME

Engineer with an expertise in computational physics interested in solving complex problems using applied mathematics, modeling and numerical simulation, and machine learning

## EDUCATION

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|---|---|
| **Stanford University**, Ph.D. in Chemical Engineering (4.068 GPA) | Expected 2021 |
| **Stanford University**, M.S. in Chemical Engineering (4.068 GPA) | 2019 |
| **The University of Texas at Austin**, B.S. in Chemical Engineering with Highest Honors (4.00 GPA) | 2016 |

## RESEARCH EXPERIENCE

**Graduate Researcher**, Advisor: Prof. Eric S.G. Shaqfeh, Stanford University                                        2016 – Present
- Designs and writes algorithms from scratch in Fortran to simulate systems involving fluid-structure interaction
- Created first fully resolved 3D simulation of microorganisms swimming in complex fluids
- Collaborates with others to design, test, and enhance the research group's massively parallel multiphysics flow solver
- Visualizes and analyzes large datasets from computational fluid dynamics simulations using Python, Matlab, and Tecplot
- Communicated results to broad scientific audiences at the SIAM CSE 2019 and APS DFD 2020 conferences

**Undergraduate Researcher**, Advisor: Prof. Roger T. Bonnecaze, The University of Texas at Austin                         2015 – 2016
- Prototyped nano-patterning via selective reduction of a thin metal oxide film through COMSOL simulations
- Utilized molecular simulations to compute rheological properties of soft particle glasses modeled as Herschel-Bulkley fluids

**Undergraduate Researcher**, Advisor: Prof. Doraiswami Ramkrishna, Purdue University                                      2014
- Modeled the signaling molecule network that populations of bacteria use to regulate the transfer of antibiotic resistance
- Simulated stochastic chemical systems via a parallel tau-leaping algorithm

## PUBLICATIONS

1. **Binagia, J. P.**, Phoa, A., Housiadas, K., Shaqfeh, E. S. G. Swimming with Swirl in a Viscoelastic Fluid. *In review.*
2. Guido, C. J.\*, **Binagia, J. P.**\*, Shaqfeh, E. S. G. *Soft Matter*, doi: 10.1039/C8SM02518E
3. Shu, C.-C., Tran, V., **Binagia, J.**, Ramkrishna, D. *Chemical Engineering Science*, doi: 10.1016/j.ces.2015.06.066

## MACHINE LEARNING PROJECTS

**Analyzing and Predicting Treatment Effects for Schizophrenia Patients** (github.com/jbinagia/stats202-final-project)        2019
- Developed and evaluated hypothesis tests in R to assess statistical significance of an administered drug
- Used unsupervised learning methods including clustering and principal component analysis (PCA) to define patient groups
- Placed 4th out of 44 teams in a Kaggle competition for forecasting future severity of schizophrenia symptoms
- Created a classifier to predict the probability of a patient diagnoses being erroneous (placed in top 28% of competition)

**Efficient Sampling of Equilibrium States Using Artificial Neural Networks** (github.com/jbinagia/CS-230-Final-Project)      2019
- Implemented a deep neural network in PyTorch that learns simple latent space descriptions of molecular configurations

## SKILLS

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| *Languages (years):* | Python (4), MATLAB (8), Fortran (4), C++ (2), R (1) |
| *Software:* | COMSOL, Linux, Git, Pandas, NumPy, PyTorch, TensorFlow, Keras, MPI, CUDA, OpenMP |
| *Theory:* | Finite element analysis, Optimization, Statistical modeling, Deep learning, Parallel computing |

## SELECTED AWARDS & HONORS

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| National Science Foundation (NSF) Graduate Research Fellowship (fund 3 years, valued at $140,000) | 2016 – 2019 |
| National Defense Science & Engineering Graduate (NDSEG) Fellowship Awardee (5 - 10% acceptance rate) | 2016 |
| Stanford Blueprint Datathon Finalist (annual hackathon focused on big data) | 2019 |
| Eagle Scout, Boy Scout Troop 75 – Port Arthur, TX | 2012 |

## LEADERSHIP, TEACHING, & COMMUNITY SERVICE

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| **Instructor,** Applied Mathematics in the Chemical and Biological Sciences (5/5 median score for course evaluations) | 2018 – 2019 |
| **Program Coordinator,** Science Teaching Through Art (STAR) | 2019 |
| **Instructor,** Stanford Prison Education Project | 2019 |

*\* These authors contributed equally*