Monica E. Shapiro

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Department of Chemical & Petroleum Engineering, University of Pittsburgh, 940 Benedum Hall, Pittsburgh, PA 15213

Research Interests

Dynamical systems modeling and simulation, parameter optimization, forecasting, uncertainty.

Education

University of Pittsburgh   **Pittsburgh, PA**
Ph.D. in Chemical Engineering, GPA – 3.88   *2017 – 2022 (Expected)*
    Thesis Advisors: Robert S. Parker, Ph.D. and Timothy E. Corcoran, Ph.D.

Lehigh University   **Bethlehem, PA**
B.S. in Chemical Engineering, GPA – 3.48   *2013 – 2017*

Research Positions

University of Pittsburgh

Graduate Student Researcher   *2017 – Present*
    Thesis Title: "Towards Personalized Medicine in Cystic Fibrosis: Patient-Specific Modeling of Mucociliary Clearance and Airway Surface Liquid Absorption"
    Advisors: Robert Parker and Timothy Corcoran

Built open-source profile likelihood estimator package in Python (`plepy`). Mentored an NSF REU summer intern on a profile likelihood project. Developed physiologically-based dynamic model of mucus clearance through airways that captures spatial differences between subjects. Future work aims to extend model to include airway surface liquid absorption and link parameters to tissue-scale model.

REU Intern   *Summer 2016*
    Advisors: Robert Parker and Timothy Knab

Designed graphical user interface for pharmacokinetic/pharmacodynamic model of IV chemotherapy treatment for solid tumors. Modified dynamic models to adapt drug sensitivity parameters based on real-time clinical data.

Lehigh University

Undergraduate Researcher   *Fall 2016*
    Advisor: Jeetain Mittal

Ran molecular dynamics simulations of coarse-grained model using LAMMPS. Computed binding energies of single-stranded DNA adsorption on carbon nanotubes.

Publications

1. Serrano Castillo, F., ..., **Shapiro, M. E.**, et al. "A physiologically-motivated model of cystic fibrosis liquid and solute transport dynamics across primary human nasal epithelia." *Journal of Pharmacokinetics and Pharmacodynamics* (2019).

2. **Shapiro, M. E.**, Corcoran, T. E., Bertrand, C. A., Serrano Castillo, F. & Parker, R. S. "Physiologically-Based Model of Fluid Absorption and Mucociliary Clearance in Cystic Fibrosis." *IFAC PapersOnLine* **51**, 102–103 (2018).

3. Serrano Castillo, F., Bertrand, C. A., Corcoran, T. E., **Shapiro, M. E.** & Parker, R. S. "A Dynamic Model of Cystic Fibrosis Airway Epithelium Electrophysiology." *IFAC PapersOnLine* **51**, 94–97 (2018).

Awards and Honors

Outstanding Teaching Assistant Award — **University of Pittsburgh**
Awarded by the Engineering Graduate Student Organization. — *2021*

Research Experience for Undergraduates (REU) — **National Science Foundation**
Host Institution: University of Pittsburgh — *2016*

Elisha P. Wilbur Mathematics Prize — **Lehigh University**
Awarded to the highest ranking freshman engineers in mathematics. — *2014*

Conference Presentations

1. Shapiro, M. E., Corcoran, T. E., Bertrand, C. A. & Parker, R. S. "Up, Up, and Away: A Physiologically-Motivated Dynamic Model of the Lung's Mucociliary Clearance Escalator." Oral presentation at *American Institute of Chemical Engineers (AIChE) Annual Meeting*, **Boston, MA**, 2021.

2. Shapiro, M. E., Parker, R. S., Bertrand, C. A., Serrano Castillo, F. & Corcoran, T. E. "Mathematical Model of Mucociliary Clearance and Airway Surface Liquid Absorption Dynamics." Poster presentation at *North American Cystic Fibrosis Conference (NACFC)*, **Nashville, TN**, 2019.

3. Shapiro, M. E., Corcoran, T. E., Bertrand, C. A., Serrano Castillo, F. & Parker, R. S. "Physiologically-Based Model of Fluid Absorption and Mucociliary Clearance in Cystic Fibrosis." Poster presentation at *Foundations of Systems Biology in Engineering (FOSBE)*, **Chicago, IL**, 2018.

Teaching

Reactive Process Engineering (CHE 0400) — **University of Pittsburgh**
Teaching Assistant — *Spring 2021*
  Taught weekly virtual recitations, held office hours, made solution guides, and graded. Designed introductory MATLAB recitation. Won **Outstanding TA Award** for my role in this course.

Engineering a Craft Brewery (ENGR 1933) — **University of Pittsburgh**
Grader — *Spring 2021, Spring 2020, Spring 2019, Spring 2018*
  Graded final exam, homeworks, and sensory perception quizzes.

Systems Engineering I: Dynamics and Modeling (CHE 0500) — **University of Pittsburgh**
Teaching Assistant — *Fall 2019, Fall 2018*
  Taught weekly recitations using Simulink/MATLAB, held office hours, and graded.

Methods of Analysis in Chemical Engineering (CHE 201) — **Lehigh University**
Apprentice Teacher — *Fall 2016*
  Assisted with weekly computational labs using MATLAB, Excel, and Aspen Plus. Led lab when instructor was absent. Held weekly office hours and graded.

Leadership Roles

- Graduate Women in Engineering Network – President (2020 – Present), Treasurer (2019 – 2020)
- Ingenium – Editorial Board (2019 – Present)
- Chemical Engineering Graduate Safety Committee – Lab Representative (2018 – 2020)
- Chemical Engineering Graduate Student Association – Recruitment Chair (2018 – 2019)

Skills

Computer Skills: Python, MATLAB/Simulink, R, Blender, HTML5/CSS, Aspen Plus/Dynamics
Languages: Native - English; Familiar - French
Relevant Coursework: Bayesian Signal Processing, Optimal Control, Statistical & Computational Methods for Systems Biology, Data Inference & Applied Machine Learning, Advanced Scientific Visual Communication, Molecular Modeling and Simulation