# Sebastian **Bernasek**

Data Scientist | Chemical Engineer

*San Francisco Bay Area*

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## Skills

**Coding**
- Python & Cython
- Matlab, Mathematica
- Linux/Unix, OSX
- Git, LaTeX, Adobe CS

**Modeling**
- Stochastic processes
- ODE/PDE systems
- Machine learning
- Agent-based modeling

**Analysis**
- Hypothesis testing
- Bayesian inference
- Time series
- Networks

**Computer Vision**
- Image segmentation
- Feature classification
- Spatial analysis
- Quantitative microscopy

**Process Engineering**
- Design & optimization
- Opex/Capex estimation
- Life cycle analysis, GREET
- Process simulation, HYSYS

## Education

**Ph.D. in Chemical and Biological Engineering • 4.0** *Northwestern University* *2014 - 2019*

*Dissertation* offers two exciting discoveries:
- Harmful genetic mutations can be suppressed by slowing metabolism. Published in *Cell*.
- Cell fate decisions may be executed via ratiometric sensing. Manuscript under review.

**B.S. in Chemical Engineering • 3.8 • High Honors** *University of California, Santa Barbara* *2008 - 2012*
- Exchange student at Imperial College London throughout 2010/2011.

## Experience

**Personal Development** *Present*

Took a year off to pursue some personal projects while exploring the world.

**Graduate Student at Northwestern University** *Evanston, IL* *2014 - 2019*

Developed novel computational methods to study how cell types are defined during the formation of the fruit fly eye:
- *FlyEye Analysis*: computer vision tools for measuring fruit fly gene expression dynamics.
- *FlyQMA*: computer vision tools for high-throughput quantification and analysis of microscopy data.
- *TFBinding*: platform for statistical mechanical modeling of transcription factor DNA binding.
- *GeneSSA*: framework for rapid stochastic simulation of biochemical reaction networks.

Day to day life entailed:
- Exploratory analysis of image and time series data.
- Brainstorming & hackathons for many other data science projects, both social and biological.
- Frequent collaboration to facilitate experimental design and data collection.
- Lots of reading, writing, presentations, and constructive criticism.
- Co-teaching several undergraduate chemical engineering courses and a data science bootcamp.
- Mentoring graduate, undergraduate, and high school students.

**Process Engineer at LanzaTech** *Chicago, IL* *2012 - 2014*
- Invented three processes for converting waste gases to lipid products. One patent granted, two more applications pending.
- Designed and built the company's core process modeling framework.
- Identified promising technology partners, ultimately leading to major investments.
- Modeled refinery-scale processes to predict and optimize economic and life-cycle performance.
- Advised corporate leadership and investors with technical analysis.

**Research Assistant at UC Santa Barbara** *Santa Barbara, CA* *2011 - 2012*
- Obtained first ever dynamic measurements of interaction forces between vesicles. Published in *Soft Matter*

**Summer Intern at UL Air Quality Sciences** *Atlanta, GA* *Summer 2011*

## Publications

**Ratio-based sensing of two transcription factors regulates the transit to differentiation.** *Under Revision*

*Sebastian Bernasek**, J.F. Lachance*, N. Peláez*, R. Bakker, H. Navarro, L. Amaral, N. Bagheri, I. Rebay, R. Carthew *Expected 2020*

**Fly-QMA: Automated analysis of mosaic imaginal discs in Drosophila.** *Published in PLOS Comp. Biology*
*Sebastian Bernasek*, N. Peláez, R. Carthew, N. Bagheri, L. Amaral *2020*

**Repressive gene regulation synchronizes neural development with cellular metabolism.** *Published in Cell*
J. Cassidy*, *Sebastian Bernasek**, R. Bakker, R. Giri, N. Peláez, B. Eder, A. Bobrowska, N. Bagheri, L. Amaral, R. Carthew *2019*

**Quantitative analysis of cell fate decisions.** *Doctoral Dissertation*
Sebastian Bernasek *2019*

**Direct measurement of interaction forces between charged multilamellar vesicles.** *Published in Soft Matter*
J. Frostad, M. Seth, *Sebastian Bernasek*, L.G. Leal *2014*

## Patents

**US Patent App. 62/872,869, Methods for Optimizing Gas Utilization.** *LanzaTech*
*Sebastian Bernasek* & Co-inventors *Filed 2019*

**US Patent App. 14/927,950, Fermentation process for the production of lipids.** *LanzaTech*
Sean Simpson and *Sebastian Bernasek* *Filed 2014*

**US Patent 9,783,835, Method for producing a lipid in a fermentation process.** *LanzaTech*
Sean Simpson and *Sebastian Bernasek* *Granted 2017*

## Mentorship

**Simran Khunger** *High school student* *Summer 2017*
Project: Designing synthetic benchmarks for 3D segmentation of cell membranes in the larval *Drosophila* eye.

**Darshan Patel** *Chemical engineering undergraduate* *Summer 2016*
Project: Probing tradeoffs between efficiency and robustness via in silico evolution of GRN topologies.

## Teaching

**Chemical Engineering Methods and Analysis** *Spring 2018*

**Reaction Engineering and Kinetics** *Spring 2017*

**Process Engineering and Design** *Spring 2016*

**Data Science Bootcamp** *Summer 2015*

**Reaction Engineering and Kinetics** *Spring 2015*