

# Fernando Becerra

ASTROPHYSICIST · DATA SCIENTIST

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## Education

### Harvard University

PH.D. IN ASTRONOMY & ASTROPHYSICS

*Thesis: Formation of Supermassive Black Hole Seeds, Advisor: Lars E. Hernquist.*

Cambridge, MA

May 2018

### Harvard University

A.M. IN ASTRONOMY & ASTROPHYSICS

Cambridge, MA

May 2014

### Universidad de Chile

M.SC. IN ASTRONOMY, WITH HIGHEST HONORS

*Thesis: A Study of Galactic Star Formation and Massive Black Hole Growth Through Simulations, Advisor: Andrés Escala.*

Santiago, Chile

Aug 2012

### Universidad de Chile

B.SC. IN ASTRONOMY, WITH HIGHEST HONORS

Santiago, Chile

Dec 2009

## Work Experience

### Freelance Developer

DATA SCIENCE AND DATA VISUALIZATION

Santiago, Chile

May 2020 to date

- *Golden Set Analytics*: Created a Python module to analyze and process a tennis matches database to model their behavior and predict outcomes using Machine Learning algorithms.
- *Human Intelligence*: Used d3.js to make an interactive network visualization of the relation between papers or authors based on citation metrics.
- *Emteq Labs*: Used HTML Canvas to create an interactive plot to show time series of different measurements of user responses to immersive experiences.
- *Pontifical Catholic University of Chile*: Used Python to process a cohort database and create Hattori plots for subjects with and without Non-Alcoholic Fatty Liver Disease.
- *Copenhagen Atomics*: Used d3.js to create an interactive line plot to show temperature from different sensors in real-time.
- *Needle Genomics*: Created interactive visualization to explore single cell RNA-seq data by plotting their t-SNE coordinates using d3.js.

### Fathom Information Design

DATA VISUALIZATION DEVELOPER

Boston, MA, USA

Jun 2018 - Jun 2019

- Coded back end and designed front end prototype for *Laniakea* app (<http://laniakea.fathom.info>)
- Used Python packages such as spaCy and nltk to perform Natural Language Processing techniques on large document sets.
- Implemented topic modeling to group and classify more than 100,000 documents using LDA, NMF, and t-SNE.
- Optimized routines for fast processing with NumPy, SciPy, and multiprocessing, achieving a 100x speed increase.
- Coded back end and designed front end prototype for *Myriscope* app (<http://myriscope.com>).
- Used Machine Learning libraries to extract and consolidate abstract, sections, and figures from academic papers.
- Created prototype for front end employing Javascript, jQuery, CSS and HTML.
- Coded back end and front end for *The Joy of Parsing* (<https://fathom.info/bobross/>).
- Scrapped all 403 transcripts from the show *The Joy of Painting* using the YouTube API and packages such as BeautifulSoup.
- Analyzed, grouped, and classified the transcripts using NLP techniques and Python packages like spaCy and nltk.
- Created interactive tool to explore paintings of the show using d3.js.

## Harvard University, Department of Astronomy

Cambridge, MA, USA

GRADUATE RESEARCH ASSISTANT

Aug 2012 - May 2018

- Explored the formation of stars and black holes in the early Universe.
- Lead, guided, directed, and managed group of collaborators to design and execute a research plan.
- Implemented new modules for primordial chemistry and sink particles in C for the *arepo* code to model behavior of black holes.
- Developed tools to generate plots, images, and videos of simulation outputs: the Python analysis tool *pacha* using packages like NumPy, SciPy, and matplotlib; and the parallel C analysis tool *sator* using MPI.
- Reported findings in astronomy journals like *Monthly Notices of the Royal Astronomical Society* and *The Astrophysical Journal*.
- Presented results in astronomy conferences across many continents.
- Mentored and supervised undergrad and graduate students.

## EdX

Cambridge, MA, USA

WEB DEVELOPER

Jul 2017 - May 2018

- Built and developed a webpage using HTML, CSS and JavaScript to host an interactive module to explain randomness and normal distribution.
- Coded a tabletop simulation in three.js as the central element of the module.
- Created a matrix plot with d3.js to visualize the results of many realizations of such simulation.
- Linked both elements and added interactivity between them to control parameters and analyze how they influence the results.

## Universidad de Chile, Department of Astronomy

Santiago, Chile

GRADUATE RESEARCH ASSISTANT

Mar 2010 - Aug 2012

- Conducted independent research on the relation between star formation and properties of the host galaxy.
- Modified old modules and added new ones in C and fortran to the code *Enzo*.
- Developed the Python analysis package *pigs* based on the *yt* code to analyze simulation outputs.
- Coded analysis routines in IDL to examine simulation outputs from the code *Gadget*.
- Presented results in paper published in *The Astrophysical Journal*.

## Data Science & Visualization Projects

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GitHub	<a href="https://github.com/fbecerra">https://github.com/fbecerra</a>
Fathom	<a href="http://laniakea.fathom.info">http://laniakea.fathom.info</a>
	<a href="https://fathom.info/bobross">https://fathom.info/bobross</a>
	<a href="https://myriscopes.com">https://myriscopes.com</a>
Interactive	<a href="http://astrollytelling.github.io">http://astrollytelling.github.io</a>
	<a href="http://www.fernandobecerra.com/reformas">http://www.fernandobecerra.com/reformas</a>
	<a href="http://www.fernandobecerra.com/covid19chile">http://www.fernandobecerra.com/covid19chile</a>
	<a href="http://www.fernandobecerra.com/ex2">http://www.fernandobecerra.com/ex2</a>

## Skills

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<b>Programming</b>	Python, C, fortran, IDL, MATLAB, Javascript, Java, LaTeX
<b>Web</b>	HTML5, CSS, jQuery, D3.js, Three.js, Processing
<b>Software</b>	Adobe Photoshop, Adobe Illustrator, Microsoft Office Suite
<b>Languages</b>	English, Spanish
<b>Other</b>	Landscape and Nature Photography