Why Tech Companies Care About Your Physics PhD

Souvik Dutta
Ph.D., UIUC 2021
40% of Physics PhDs obtain PostDoc positions overall.

The reality beyond obtaining PostDoc positions.
https://physicsworld.com/a/the-academic-pyramid/
## Academia and Industry: what’s the link?

<table>
<thead>
<tr>
<th>Daily Life in a Tech Job</th>
<th>Transferable Skills from a Physics PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attend team meetings, ask questions</td>
<td>Research group meetings</td>
</tr>
<tr>
<td>Invited to external meetings</td>
<td>Attended workshops and schools</td>
</tr>
<tr>
<td>Competitive Analysis</td>
<td>Reading papers on arXiv</td>
</tr>
<tr>
<td>Make presentations to own team</td>
<td>HEP/CMP journal club presentations</td>
</tr>
<tr>
<td>Make presentation to external teams</td>
<td>Poster PPTs, talks in conferences</td>
</tr>
<tr>
<td>Maintain code/codebase</td>
<td>Coding on Mathematica/MATLAB, etc.</td>
</tr>
<tr>
<td>Mentor summer interns</td>
<td>Mentor first/second Year grad students</td>
</tr>
<tr>
<td>Communicate with PMs, SDEs, CX, UX</td>
<td>Collaboration between theory/experiment</td>
</tr>
<tr>
<td>Make $$$</td>
<td></td>
</tr>
</tbody>
</table>
OK, but...

I am giving up on my dream to be a Physics Professor, is it worth it?

- Can still work on interesting problems
  (Think Meta VR, Tesla Autopilot, Automated trading)
- Problems you solve will help the society/humanity *right now*
- Don’t have the need to publish or perish
- The guy in the next office is not your competitor
  (You’re not applying for the same grant, position, etc.)
- You are driving a commonly shared goal across your company
- If you don’t like your boss/team/company goals, it’s easy to switch out
- Most people are extremely punctual, and they respect your time
- Your weekends are your weekends
## Let’s talk money

<table>
<thead>
<tr>
<th>Company</th>
<th>Position</th>
<th>Average Salary (YR)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citadel</td>
<td>Quantitative Researcher</td>
<td>$246,823 / YR</td>
<td>$194K</td>
<td>$317K</td>
</tr>
<tr>
<td>Two Sigma</td>
<td>Quantitative Researcher</td>
<td>$249,344 / YR</td>
<td>$197K</td>
<td>$323K</td>
</tr>
<tr>
<td>JPMorgan Chase &amp; Co</td>
<td>Quantitative Researcher</td>
<td>$188,188 / YR</td>
<td>$151K</td>
<td>$239K</td>
</tr>
<tr>
<td>Jump Trading</td>
<td>Quantitative Researcher</td>
<td>$227,408 / YR</td>
<td>$179K</td>
<td>$295K</td>
</tr>
<tr>
<td>Squarepoint Capital</td>
<td>Quantitative Researcher</td>
<td>$190,527 / YR</td>
<td>$150K</td>
<td>$246K</td>
</tr>
<tr>
<td>Meta</td>
<td>Quantitative Researcher</td>
<td>$237,357 / YR</td>
<td>$192K</td>
<td>$300K</td>
</tr>
<tr>
<td>Citadel Securities</td>
<td>Quantitative Researcher</td>
<td>$271,090 / YR</td>
<td>$214K</td>
<td>$352K</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Senior Data Scientist</td>
<td>$237,515 / YR</td>
<td>$191K</td>
<td>$301K</td>
</tr>
<tr>
<td>IBM</td>
<td>Senior Data Scientist</td>
<td>$179,546 / YR</td>
<td>$143K</td>
<td>$227K</td>
</tr>
<tr>
<td>Walmart</td>
<td>Senior Data Scientist</td>
<td>$221,621 / YR</td>
<td>$178K</td>
<td>$281K</td>
</tr>
<tr>
<td>Netflix</td>
<td>Senior Data Scientist</td>
<td>$261,267 / YR</td>
<td>$203K</td>
<td>$343K</td>
</tr>
<tr>
<td>Nielsen</td>
<td>Senior Data Scientist</td>
<td>$173,064 / YR</td>
<td>$140K</td>
<td>$217K</td>
</tr>
<tr>
<td>Aetna</td>
<td>Senior Data Scientist</td>
<td>$164,422 / YR</td>
<td>$137K</td>
<td>$199K</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>Senior Data Scientist</td>
<td>$269,319 / YR</td>
<td>$213K</td>
<td>$348K</td>
</tr>
</tbody>
</table>
Preparing for a Machine Learning Interview

- Some coding skills are essential: R, C++, Java, Python
  - LeetCode
  - HackerRank
  - GeeksforGeeks
- Machine Learning skillset
  - Coursera
  - DeepLearning.AI
  - DataCamp
- ML Tech Blogs
  - Towards Data Science
  - Machine Learning Mastery
- Industry Blogs
  - Amazon Science
  - Google AI
  - DeepMind
Preparing for a Machine Learning Interview*  

* as a Physicist

- The most **difficult** equation in machine learning is

\[
\frac{\partial h}{\partial x_1} = \frac{\partial h}{\partial u_1} \cdot \frac{\partial u_1}{\partial x_1} + \frac{\partial h}{\partial u_2} \cdot \frac{\partial u_2}{\partial x_1}
\]

- The most **complex** function used in machine learning is

\[
p(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}
\]

- The hard bit is to develop an intuition for these algorithms, which model to use, what happens when we tweak parameters, etc.

https://scikit-learn.org/stable/
Curriculum Vitae

- Format: Don’t worry about searching for fancy, colorful, complex templates. A plain old boring B/W template works.

- Write accomplishments with X-Y-Z
  “Accomplished [X], as measured by [Y], by doing [Z]”

- Start every accomplishment with a verb in past tense. Strong Verbs (Led) >>>> Soft Verbs (Assisted)
  Led, Designed, Researched, Prioritized, etc.

- Might want to skip the “skills” section entirely by embedding skillset inside of accomplishments – helps bring out the context in which the skills were applied

- Not every accomplishment has to have impact but try to add as many as you can. Impact shows that you can do the job - well and make a difference. (What is it that without YOU it wouldn’t have been possible? What did it cause? How did you measure what happened?)

- Length? 1, 2, 3 pages are ALL ok. You may have a lot of experience. Make it RELEVANT, that’s what matters. Tailoring your resume to the job >>>> almost everything else. Don’t submit the same resume to every job.

Triple-check for grammar/spelling mistakes.

Courtesy: Diego Granados, Product Manager at Microsoft
LinkedIn

About

- About yourself, that is not evident/obvious/included elsewhere
- List any personality traits that makes you well-suited to the job you seek/do
- How has your past career shaped you for the future you
- Any overarching goals in life that you like to see fulfilled through your present/future corporate positions?
- DO NOT list down your tech skills; **DO NOT brag**
Network, Network, Network

WHOM?

WHY?

WHEN?

HOW?