Job Searching Guide for the Proactive Upcoming STEM Graduate

In this repository I'd like to share my tips and tricks for being successful when applying for STEM positions as a college student. Since I work in the data engineering field, much of this is tailored towards STEM students who will be doing programming in some shape or form as a part of their first job. I use examples from data science throughout, but much of this advice can be applied to other career areas.

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Who am I?

I graduated with a degree in Applied Mathematics with a specialization in Physics, and dual minors: Psychology and Applied Meteorology. In my final year, I lead a research project in Data Science / Machine Learning, and promptly found my way into the data industry. I applied for roughly 60-80 jobs in my final two semesters and got hired a few weeks before I graduated.

As part of my job I had the opportunity to represent my company at multiple job fairs at Boston University and Harvard University, and then be an active part in the selection of candidates for the following years' new hires. It was an eye-opening experience to, within only a short period of time, go from being the candidate to seeing how I was picked, and being the company rep at a job fair. So, I figure it would be worth it to help other fresh graduates have a better shot at getting their foot in the door of the world of STEM opportunities.

Truth & Basics

The realities to understand about being a successful bachelors-to-industry job finder:

1. You will need a portfolio.
2. You will need to apply for jobs outside your local region.
3. You will need to have *some* experience with relevant tech in your field.
4. You will need to start the job-searching process in or before your 2nd-to-last semester to spot development program opportunities.
5. You will need to apply to dozens of jobs.

Your portfolio needs to show recruiters clearly that you are capable of using relevant technologies that the role they're hiring for uses. This company most likely will not be local - probably in or near a large city (albeit now with remote working after COVID-19 you may not have to move). It will take time to research your field's job options, build a resume, write cover letters, etc... and more importantly, you will need to be consistent in your job search to spot new relevant job postings and apply, apply, apply. The fall before your spring graduation is an important time to apply for "development programs" and other opportunities catered specifically for the well-prepared upcoming college graduate.

These are the basics of being successful at your job search.

You will need a portfolio

It's really that simple. Not a single person I saw hired and/or helped select for candidacy was missing a portfolio. You will need, at the bare minimum, a GitHub, website, or other showcasing platform to display your work. Other useful things to add to a portfolio and/or that "add additional documents" upload button that most job postings will offer: publications (undergraduate research journal publications are nothing to scoff at - that's all I had), conference posters, applicable term papers, any impressive awards, test results, etc. If you work really hard at fine-tuning a website or GitHub that you absolutely want to be looked at, then don't water your application down with a bunch of other links.

But most of all - you need to *show* that you are capable of doing industry-level work. Not just coursework. And I mean by that, for example in the world of data science, we'd want to see in your portfolio the entire process of data science-ing. Initial exploratory data analysis, choosing a model (or models, preferably), implementing the model, testing it, analyzing results, presentation of the results, visualization to make it easy to understand said results, and any other processes that you actively did to make the project happen.

I used this GitHub page as my main portfolio link, and at the time I was applying for jobs, the main attraction was a single repository with my senior research capstone. I took a complex, real-world problem from a real company and did my best to use relevant tools and technology to get results and made visualizations to share the results. **The results were not glamorous**, and

recruiters know that junior data scientists and programmers will not be perfect. But the effort and grit to stick with it shine through.

Organization, cleanliness, and clarity are imperative. Very few recruiters, if any, will spend 15 minutes trying to unzip a bunch of coursework `daniel-hw5-edited.c` files, compile them, and then run them for you.

Show, don't tell. Show attention to detail by being attentive to it, etc.

Put your resume, transcripts, portfolio links, and any other PDF's like cover letters, etc., in a single folder on your desktop. This way, when you start applying for new jobs all the time, everything is all ready to go and easily accessible for when you click "upload files" on the job application.

Certain skills to show in your portfolio

1. Organization: make it clear what the project objective was. Fancy math formulas and other complex scientific mumbo jumbo only hold their weight if you explain (in laymans terms - HR will be viewing this too - not just the scientific recruiters) the relevance to the project. Use markdown for a GitHub repo. A GitHub repo means next to nothing if there is no ReadMe to explain what all those files are about. Make clearly defined sections (goals, analysis, results, conclusion, further work), and **include graphics**.

2. Soft skills (writing, communication): A publication is a great way to show your writing skills, but you can easily show them through a well-written GitHub repo or website. Proofread and go to the Writing Center for a second opinion. Communication skills can also be demonstrated through just having experience going to conferences and even putting your conference posters as PDFs somewhere in your portfolio.

3. Attitude: Keep things professional and not too tacky. It's easily to get carried away with colors and excessive formatting, or in the case of websites, heavy scripting to make the website extra fancy. Focus more on upgrading your content and not just the format of the portfolio itself. Also, have a professional profile picture. It doesn't need to be a basic headshot, but resist the urge to put in a fancy logo of your favorite e-sports team.

4. Resiliency / "grit": no project is perfect! Showing off some roadblocks and twists and turns that you had to wrangle with throughout the duration of your research or project can be used to demonstrate your curiosity, resiliency, and even risk-taking ability and deeper logical skills.

You will (probably) need to move for the job

Plan to leave your college town or area, and start now (especially financially).

Obviously COVID-19 has shaken things up in this regard and you may very well find a fully remote junior position, which was not the norm for most junior

level positions. But, preparation to move is still a worthwhile pursuit so you do not limit your
job search.

In the world of STEM, the chance of you going to a university outside a large city, and then landing a job within driving distance in the same area are very slim. At the very least, expect to move at least to a different part of the state you're in. Obviously everybody's situation will differ (especially if your college is in the city already) - but making the mistake of limiting your job search to a single state is a huge roadblock in the process. So, when you start your job search, the absolute finest grain that you should restrict your job search is within the same state.

Moving Costs! This also means that you should start saving up NOW to make the move. Even if your new company offers to reimburse your moving expense, you'll probably get that money in your 2nd paycheck or beyond, and just a credit card may not cut it. Getting a new apartment in the city will cost you. **Using Facebook groups to find roommates** is a great idea but obviously never, ever, ever put down ANY amount of money for a place that you haven't physically been to yet. Apartments.com is full of these scams where somebody will say "ohh… I work on a ship offshore so won't be home for many months, I can ship you the key if you PayPal me"… scams are abundant in the world of renting apartments. Facebook has tons of groups, named, for example, "Seattle Housing", where people find good deals on splitting rent with like-minded people. Obviously, meet your roommates before moving in.

In this day and age it's safe to assume that you will be paying at least $1000 per month on just rent, with roommates. For a single apartment, expect $1500+ if you will not be sharing it. In Boston, add another $500. In NYC or LA, add another $1000. You will need to use those same Facebook groups for market research on how much rent generally is and therefore, how much you will need to save. When you move in, you'll need to pay 2-3 months of rent right off the bat (usually): first month, security deposit, and then there is sometimes a broker's fee of 1 month's rent. So, for a $1500 apartment, you will need $4500 off the bat just to move in. And this doesn't include furniture, pots and pans, electricity, heat, etc. etc. etc… if you have only lived in a dorm for your time in college, this change will be a bit more drastic but is nothing to worry about as long as you plan ahead. **START SAVING NOW**

Location Considerations

1. Trains / subway system / public transit / "do I need a car??" - if you move into a city (which you probably will, or outside of one), trains and public transit are great ways to get around town. Bringing a car to NYC makes zero sense, so take a look at a map of the train system in the city that you're looking at and then how it would line up with where cheap housing is. For example, in Boston, Allston and Brighton are full of college kids

because it's cheap to live there and the Green line goes straight through Boston University and into downtown. So it's a prime area to get an apartment if you want a quick 20-minute ride into the city - possibly right outside your door. **Do not be afraid to ask in Facebook housing groups about good/bad areas to live in, or trains, or any other details. People love their city and are inclined to help newcomers move in. You will see dozens of posts of people moving in for a job and needing advice from locals.**

2. Cost of living vs. your paycheck - my golden rule is that my monthly expenses (rent, electricity, food - the basics) should fit within a SINGLE paycheck. So if you're pulling in $4000 a month (two paychecks), all these basic expenses should be $2000 or less. Using websites like **SmartAsset** to figure out what your paycheck will be for a certain salary and state is a great way to budget rent appropriately. On this note, I should also mention that you should not short sell yourself - STEM careers with programming involved generally start at $60,000 / year salary.
Data scientists and software engineers can expect more like $70-$80,000 off the bat.

3. City vs. apartment location. Look up (or ask) what is considered to be the "bad" part(s) of town and steer clear. Also, try to find a good compromise between living super cheap in the suburbs with a 1-hr train ride into the city vs. a slightly more expensive and smaller studio apartment and living within 20 minutes of the city. It's tempting to live far away and avoid the associated cost of city living, but remember that you will be making friends and wanting to do things within the city that you're working in - so don't put yourself too far out there where it'll be annoying to ride into the city for the night.

You will need to have *some* experience with relevant tech in your field

It should go without saying that if you have never used Python or R, the chance of you landing a data science job are nearly 0%. Sure, you can take all the courses you want about data analysis, business intelligence, and MATLAB, but unless you've actually done a data science project, you won't be anywhere near the caliber of other applicants to the position.

An easy way to figure out what tech is being used in your industry is to go on Indeed.com, plug in the name of your major or the name of the job you want, and see what is listed on these job postings as "required". Job postings generally have a section where they list out what the candidate should be able to do and work with. For software and programming positions, these requirements will be... software technologies. Git / Version Control, Python, R, C++, SQL, and TensorFlow are a few examples. You may start to see that there are common patterns in many of these job postings - and those are the technologies that you want to focus on.

If you haven't had coursework or projects where you used relevant technology   Your first step should be to ask your university about a student license for the technology. For example, MATLAB is extraordinarily expensive, but getting a student license through a university to experiment with it is normally free. To learn how to use the tech, if courses are not available and your professors are too old to know how to use TensorFlow, then YouTube, edX, Coursera, and other online learning platforms are your friend. StackOverflow has thousands of well-written posts regarding common questions that arise when using new software technology, for example.

When I started looking to data science as a career, I realized I needed to learn R. I paid $30 or so for an online learning platform called DataCamp and took as many courses as I could on there that dealt with R and data science. Then I did my entire capstone project using R, and my portfolio was filled with R scripts and experience using common R packages like Tidyverse. This seriously set me apart from other applicants who took a course using R and then forgot about it.

To show employers that you learned how to use relevant technology, do a personal project or university-associated research using that technology.
This is obviously easy to do with data science - just pick a dataset about your favorite baseball team, hobby, or interest, and start mining. For other STEM fields, you may look into designing something like hardware for a personal hobby of yours, or doing analysis on water samples in your hometown... you get the idea. Making the objective or focus of your research personal will make it most enjoyable for you to work on the project, and that will relay over to the recruiters that you have a passion for your field and have some experience applying the technology to a real-world situation. Finding a professor who works in research areas similar to your interests, and then working with them on a project and incorporating the technology, or even taking an independent research course will make your work be held with an even higher weight once you leave undergrad.

You will need to start the job-searching process early in your final year

I recommend that you begin taking a look at what is available and relevant to your degree program in the summer before your final year starts. There will not be many job postings available that are relevant to you yet - but it is good to get a hold of your portfolio, fine-tune your resume, consider where you may want to move (or a city to focus your job search on), and all the other supporting work that goes with job searching. Attempting to do all of these within your last semester is simply going to be too chaotic and will undoubtedly be watered down by some level of partying and trying to enjoy your last moments in college. Your goal should be to get hired **during your last semester**, so that the job is waiting for you when you graduate.

Development Programs are golden opportunities Reminder that many "development programs" and other opportunities specifically catered to college graduates are generally advertised in the fall before the year the next cohort will start (i.e. advertised in fall 2019, cohort starts working spring 2020). These are huge opportunities that early birds can apply to in preparation for their upcoming graduation, even though it may feel a long ways away.

Note that many applications will normally ask you when you are available to begin working. And if this is not explicitly asked for, it will probably come up in the screening (or further) interviews if you are selected. So you will just tell the recruiter when your degree is set to be completed (ex. May), and what time during that month you think you'd feasibly be able to move out to location and start the job. I'd give yourself at least 2 weeks to make this happen at a minimum after graduation. My point is that it *is not uncommon to tell a company that you are not ready to work for many weeks*. Do not make the mistake of thinking that once you have accepted a job offer, you need to immediately start. Companies that hire during springtime know that many of the new hires will start at different times as degrees finish up and people get themselves set to start working full time in a new location. This is why it's perfectly feasible to start applying in January for jobs that you won't even be qualified for (sans degree) and couldn't even start until end of May.

Companies expect an influx of new graduates around springtime and will start posting positions as early as January with start dates in May, June, and July. If you miss this window of hiring, you may see that the number of relevant jobs being posted drops significantly, and therefore it will become more difficult to land those jobs because everybody else will be scrambling to get them! This is the reason why **I do not recommend taking the summer off after you graduate** - I know it sounds sad to not enjoy your success in getting a degree by returning home and then partying all summer, but you should keep the momentum going and begin work shortly after you graduate. It is a good idea to interview with all that knowledge fresh in your brain as well.

You will need to apply to dozens of jobs

As I mentioned before, I applied to about 60-80 jobs. About half of these sent me an email saying that the company would not be moving forward with my application, and another 30% of them simply ghosted. Another large chunk may have called me, or emailed me for a quick chat, but then disappeared or I got a similar email about not moving forward with my app. The last 5% I actually got an interview with and moved on with the application.

This is par for the course in the STEM world. It is very competitive and it will take at the very least 2-4 weeks before you hear back about an application. So you are NOT going to plan to apply for one job, wait for them to get back to you, realize you've been denied, and then apply for another. It does not work like that. **Apply to as many positions as possible** as long as your experience

roughly matches up to what the company wants. Generally you do not need every single box to be checked (i.e. every single tech they list you have used), but you need at least 50% of the requirements to directly match up with you.

This is of course, where it comes in handy to be flexible and willing to move far and wide within the US to start a new job. I applied for jobs in the Northeast (Boston in particular - and particularly excluding NYC - sorry NYC fans, it's not for me), the West coast (nearby LA, Seattle, Portland), and some wild cards like Chicago, Austin, and Charlotte. I had interviews with a company in Portland and one in Boston, and ended up taking the one in Boston. But, at the end of the day, I was ready to move to anywhere in the US.

Obviously, you can choose a general area like the Southeast or Northeast if you really like the climate of one area. But think long and hard if you will actually care about staying where you are for college - once you get busy with work, things change and free time is different.

Job titles

Try not to stress precisely what your job title will be. Obviously, there will be differences in the job responsibilities of junior roles, but the overall goal of your job search should be to get your foot in the door of the industry. Whether this means you start as a junior engineer or machine learning support intern – no matter. Landing a position is the first step. Further down the road, as you gain more experience and see what different roles there are (and firsthand how the industry differs from academia), you will probably start to jettison certain job roles that you develop distaste for the type of work involved, and gravitate towards others that seem more appealing towards you.

Rarely will you find somebody who has held the same job title over their entire career. People flip-flop between interests, make decisions to change their careers, and overall find themselves in interesting places over time. It's almost impossible to know if you will like or dislike a specific job role as you apply for your first job out of college... so, again, apply to everything!

This job-role-enjoyment process takes time and can be an enjoyable part of navigating the start of your career - there are so many options and different paths to take! Scientific industries are massive and broad beyond what you will see when just searching through online job postings.

How to use Indeed & other platforms

Indeed, Glassdoor, LinkedIn, and other fantastic job searching platforms have one ridiculous flaw: **their "beginner" level of jobs almost always requires many years of experience**. This was maddening when I applied, but there are some easy ways to narrow down search results so that you only have to shuffle through a few dozen of the "beginner with 1-3 yrs experience" positions, and land on the "0-1 years necessary" positions.

You can do this by using keywords after your main search terms. For example, say I wanted to find a data scientist position, I could use:

```
data scientist "0-1" -MS -PhD
```

```
data science "new grad" -MS
```

```
data scientist "university graduate"
```

```
junior data scientist "full time"
```

Do not be shy about using just certain technologies too:

```
Python "0-1"
```

```
R "new grad" -MS
```

```
C++ "0-1"
```

All that I am doing here is putting my main query, ie `data scientist`, and then asking the computer to only include results with a specific keyword (using quotation marks), ie `"0-1"` (which is an easy way to search for the part of the job application where the company says "0-1 years of experience in R required" or the like), and then also asking for the results where certain keywords are NOT included, ie `-MS -PhD` means that I don't want jobs looking for Master's or PhD students because obviously they will be irrelevant to me at this stage of my career.

You can also just search for a specific technology, like Python, and do the same things. Similarly, you can just put in your degree:

```
BS Mathematics "new grad"
```

```
Mathematics "university hire"
```

```
aerospace engineer "0-1" -MS
```

Obviously, there will be small differences in the way the company wrote their job postings, so you will have to experiment with different options like `B.S.`, `0-1`, `0-1yrs`, `university hire`, `college hire`, `college grad`, you get the idea. It will take some time to play around with these keywords to filter down the results - but it is well worth it.

Some fantastic keywords are:

```
new hire
university hire
university graduate
college graduate
new grad
junior
0-1
0-1yr
0-1yrs
```

```
BS [your degree]
development program
```

and any relevant technology names (Python, R, MatLab, GitHub, CAD, etc.) in combination with these.

Some good keywords to play around with using - to remove from search results:

```
-MS -PhD -M.S. -Ph.D
-intern (if you are looking for full time work)
-lead
```

Preparing for interviews

My advice to prepare for an interview is to thoroughly look through your portfolio and resume and make sure you can explain everything on them. Get used to explaining your experience with certain technologies as well as larger processes like the data science project scope that I mentioned before. It should be second nature to explain your portfolio contents and projects that you have worked on that show your skills. General interviewing advice from the internet, ie prepare for a question or two about your personality, how you've solved situations before dealing with annoying coworkers, etc., is a good place to start, but does not cut it for STEM interviews. You will generally be asked to explain what your proficiency level is in certain technologies, and definitely about projects that you've done with said tech. If you did a project about a personal interest as I suggested earlier, then these questions will be easy as you explain what you did and how you made the project happen.

For some generic data science / statistics / machine learning interview questions, view this PDF here.

Generally speaking, the job candidacy procedure happens something like: 1. You get an email from HR about the job you applied for and they want to do a quick 30-minute "screening" call. What this means is that they just want to talk to you for 30 minutes to make sure you're actually a human, actually live in the area or are willing to move, and that you basically didn't mess up on the application and are still available for work. These are simple calls that confirm to the HR department that you could be considered a candidate, simply because you are still available to work and have the basic skills listed on your resume. Almost all companies are going to run your resume through a key word searching algorithm to some extent to see if you have what they are looking for.

2. After the HR screening call, you will then have an actual interview about your qualifications and skills. This may happen in two interviews or one, and expect to hear from more advanced personnel in the company (ex. senior software engineers), who will ask you some questions to poke your brain about field-relevant stuff, like data structures, inheritance, unit testing maybe... stuff that you should know about or at least have heard about if you got a degree in the field. For data science these questions may be

a bit more math-y, like statistics related concepts or the benefits of one model over the next.

3. There may be a coding challenge before or after either any of this happens. Coding challenges are generally either designed to make you think up a novel solution to show your creativity, or just to prove that you know some programming and can write a basic loop. Regardless, don't sweat about making a syntax error - recruiters know that syntax can be tricky especially if you have written code in a bunch of languages, and that most professionals will still use Google and StackOverflow to resolve basic errors. If you know the concept of what you're trying to do, but miss a comma somewhere in the middle, chances are you will be forgiven. But if you're asking to make a while loop and have never heard of one, but you have a degree in CS... that's going to be a deal-breaker from the recruiters' end.

The interview is wrapping up and they ask if you have any questions...

This can be tricky because you are obviously new to the field and may not have any intern experience to know what you like or don't like about a certain company or job role. So, some good "neutral" questions to show your interest could be...

1. Does the company offer graduate course reimbursement?
2. Will I be expected to come into the office?
3. How large is the team I'll be working with?
4. Is the entirety of the team I'll be working on located in one area/timezone? Are some of them offshore or fully remote?
5. What is the balance of senior vs. junior colleagues on the team? Will I have support if I need it?
6. Are relocation expenses paid for?
7. What are the hours? Will I need to be flexible with hours (i.e. do 10-6 or 8-4 some days, overtime, etc.)?

Pragmatic Applications of your Academic Endeavors

Main point: right now you can be the lead data scientist and oversee a whole project end to end. Once you jump into industry, there are a lot more hoops to jump through to do even a small piece of that work. **Take advantage of this, and learn as much as possible with your freedom to tinker in any direction.**

As a junior scientist in any field, you will not be the main person making the big decisions. You will be supporting certain projects in some way, shape, or form, but not leading them - influencing some decisions, sure, but nothing to the scale of what you can accomplish by doing research in college and managing the entire process of, for example, a whole data science project. So, before

graduating, it is wise to try to gain hands-on experience in as much of the full process as possible, so that you have a much more pertinent worldview of how all the pieces fit together.

The way you do this is by engaging actively in a research project - leading or being a part of one. A research project of significant depth and coverage of a field's general acceptance criteria (ex. the entire data science process that I mentioned before) will give you a heightened sense of not only how all the pieces of the data science field fit together to help inform a business decision, but also how complex it will become in a large corporation to manage these operations, and all the while gaining more understanding of the entire scope of the field.

This is exactly what a lot of new graduates should strive to learn - the balance between knowing the technical skills required to do the work, versus the overarching skill required to make the work fit a business interest. This "overarching skill" is all the processes that are not listed as homework or technical skill - it is the understanding of the field that you're working in as a whole so that you can see what piece of the puzzle you are working on and know that things should be done a certain way to best benefit the business and all the folks down the line of what you're working on. For example, ML model characteristics to fit specific cases in business. It's something that is more of an analysis design / overarching question than a technical exercise.

The more you learn about your field, the easier it will be to impress recruiters and senior level workers during interviews when they ask you questions that you can add in your own thoughts about how it would be best to do something / the "best practices" in making, for example, a data science model as effective as it could be, after you answer their question about which model would you chose for a specific situation. Or talking about how you did something specific as part of your research project that is relevant to the question at hand - and why this was important for the project's success.

Elaboration is extraordinarily helpful for a recruiter to judge your knowledge and capability, and a project of appropriate depth will give you the ability to elaborate on decisions you made, situations you worked on and solved etc.. These added displays of knowledge in an interview that show you understand not just the material - but also how the material and what you'll be doing in the job relates to the broader picture of the company - will increase your chances of getting the job.

Salary Considerations

As mentioned before, if you are (or will be) a STEM degree holder (that's a Bachelors of Science in a field in Science, Technology, Engineering, or Mathematics), and your job function will include significant programming (if not all programming), you are worth roughly $60,000. If you are headed straight for CS (Computer Science) positions like Software Engineering, OR data science, data engineering, or similar, you are worth $70,000-$80,000+. Top-tier compa-

nies like Google, Facebook, Twitter, Spotify, and others are obviously highly competitive wildcards in which you may start out well above these figures.

Location also affects salary offers - a position in Charlotte, NC, will most likely pay less than for the same work in New York City, simply due to the cost of living gap.

Financial well-being and personal monetary decisions are obviously subjective, so I will not harp on how much you should save or other financial planning too much, however, my advice would be to live well within your means and make a long-term plan with regards to paying off student loan debt. Remember that most federal student loan programs will give you a 6-month grace period after you graduate before interest starts to fully accumulate, so remember to include what those payments will be after the first 6 months in your initial budgeting and planning.

Final Notes

This is *opinionated advice*, even though it's backed by experience, and certainly not comprehensive for every person's situation and job searching endeavor. I've put this together as a resource for students who were like me coming out of their bachelors who wanted more insight into all of this. Reminder to seek out advice from other sources like your peers, advisors, university, and anywhere else you may desire to come to your own conclusions that will fit your situation best.

For those interested in the data industry, make sure you understand the different components that make up the data science process in business, all of which have associated job roles and career areas to pursue. For example, you could focus your software engineering studies on database and data-oriented applications to aim at fulfilling a role at the bottom of the pyramid.