

# Computational Jobs Marketplace: Search, Recommendation and Beyond

Liangjie Hong, LinkedIn

Melbourne Search and Recommendation Group Meetup



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Liangjie Hong

YAHOO!  
RESEARCH

Etsy

Linked 

# Liangjie Hong





# Agenda

- 1 Online Jobs Marketplace
- 2 Existing Technology in Online Jobs Marketplace
- 3 Computational Jobs Marketplace



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- 1 Online Jobs Marketplace**
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# Online Jobs Marketplace: Job Market and Economy



# Online Jobs Marketplace: The Global Trend



*“The global online recruitment market size was \$28.68 billion in 2019 & is projected to reach **\$43.39** billion by 2027.”*

# Online Jobs Marketplace: The Global Trend

PERSONAL FINANCE

## Pandemic pushes search for remote jobs up 460%

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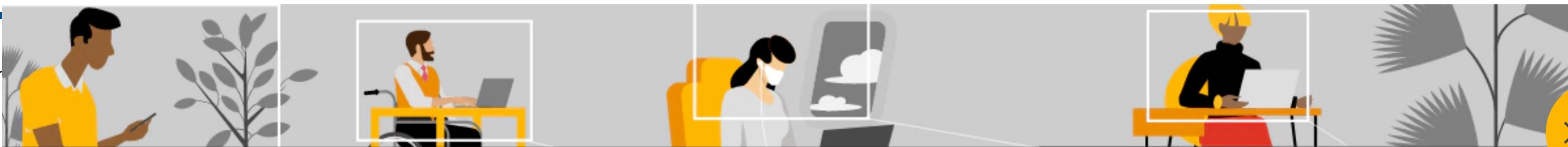


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Home > Research and insights > COVID-19 > Business needs a tighter strategy for remote work

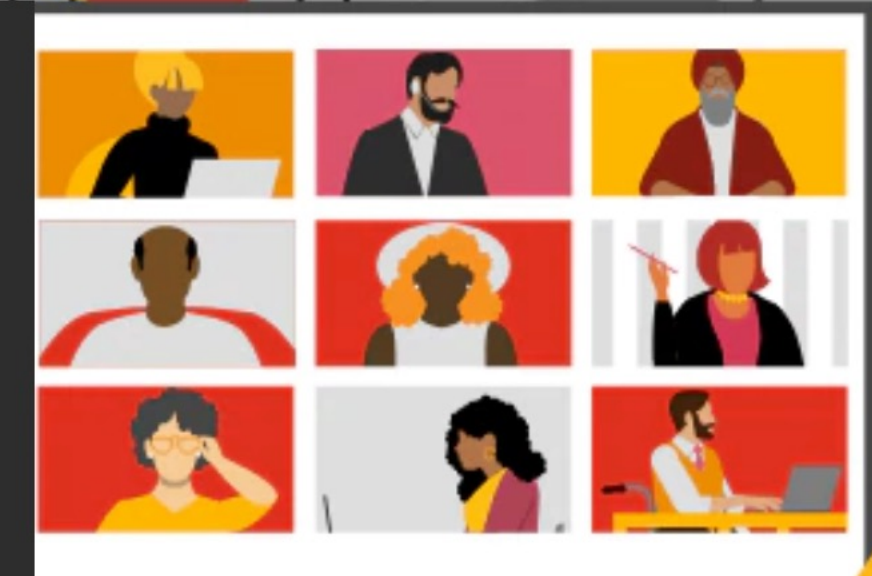
### KEY POINTS

- Job searches for remote work are up 460% according to Glassdoor data.
- Interest has tapered but remained high, suggesting the trend has staying power.
- It's unclear whether employers will leverage in the current labor market.



## It's time to reimagine where and how work will get done

PwC's US Remote Work Survey - January 12, 2021



Nine months into a monumental shift to work-from-home, business leaders are more convinced about the productivity gains achieved, but some are no closer to giving up the office.



# Online Jobs Marketplace: Overall Ecosystem



# Online Jobs Marketplace: Overall Ecosystem



# Online Jobs Marketplace: Challenges & Opportunities





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# Existing Technology in Online Jobs Marketplace

*Borrow and Adopt Their More Generic Counterparts*

# Existing Technology in Online Jobs Marketplace

The screenshot displays a job search interface for 'software engineer' in the 'United States'. The top navigation bar includes the LinkedIn logo, search input, location, and various utility icons. Below this is a filter bar with options like 'Jobs', 'Date Posted', 'Experience Level', 'Company', 'Job Type', 'Remote', 'Easy Apply', and 'All filters'. The main content area shows search results for 'Software engineer in United States' with 93,829 results. A sidebar on the left lists job recommendations from Uber, JPMorgan Chase & Co., LinkedIn, and Microsoft. The central area features search filters for 'What' (software engineer) and 'Where' (Santa Clara, CA), along with additional filters like 'Date Posted', 'Remote', 'within 25 miles', 'Salary Estimate', 'Job Type', 'Developer Skills', 'Education Level', 'Clearance Type', 'Location', and 'Company'. A detailed job listing for 'Software Engineer (Entry level, NCG)' at Yield Engineering Systems is shown, including job details, qualifications, and benefits. The interface is clean and modern, with a focus on user navigation and filtering options.

# Existing Technology in Online Jobs Marketplace

- My Jobs
- Job Alerts
- Salary
- Skill Assessments
- Interview Prep
- Resume Builder
- Job Seeker Guidance
- Application Settings

Post a free job

### Recommended for you

Based on your profile and search history.

- Director, Engineering - Search**  
Twitter  
San Jose, CA  
29 connections work here  
4 days ago • 6 applicants
- Board Member**  
boardsi  
Los Angeles Metropolitan Area (Remote)  
Actively recruiting  
Promoted • 19 applicants
- Principal Applied Scientist, Amazon F**  
Amazon  
Sunnyvale, CA  
Top applicant  
Promoted • 3 applicants

indeed Find jobs Company reviews Find salaries Upload your resume Sign in

What Recommended Where City, state, zip code, or "remote" Find jobs Advanced Job Search

Tip: Enter your city or zip code in the "where" box to show results in your area.

Date Posted Remote Salary Estimate Job Type Benefits Location Company Experience Level

Upload your resume - Let employers find you

Recommended jobs Sort by: relevance - date Page 1 of 132,631 jobs

- Chief of Staff to the GM of SMB**  
Indeed 4.3 ★  
Remote  
\$188,000 - \$272,000 a year  
Easily apply  
My Chief of Staff will start by spending a lot of time with me, joining me in meetings spanning every area of Indeed, in Austin, and around the world.  
19 days ago

- Software Engineer**  
Indeed 4.3 ★  
+15 locations Remote  
\$86,000 - \$124,000 a year  
Easily apply  
Every week sees the new release of multiple products that meet the needs of jobseekers worldwide.

I help people get jobs.

### Chief of Staff to the GM of SMB

Indeed ★★★★★ 869 reviews  
Remote • Remote  
\$188,000 - \$272,000 a year - Full-time

Apply now

#### Job details

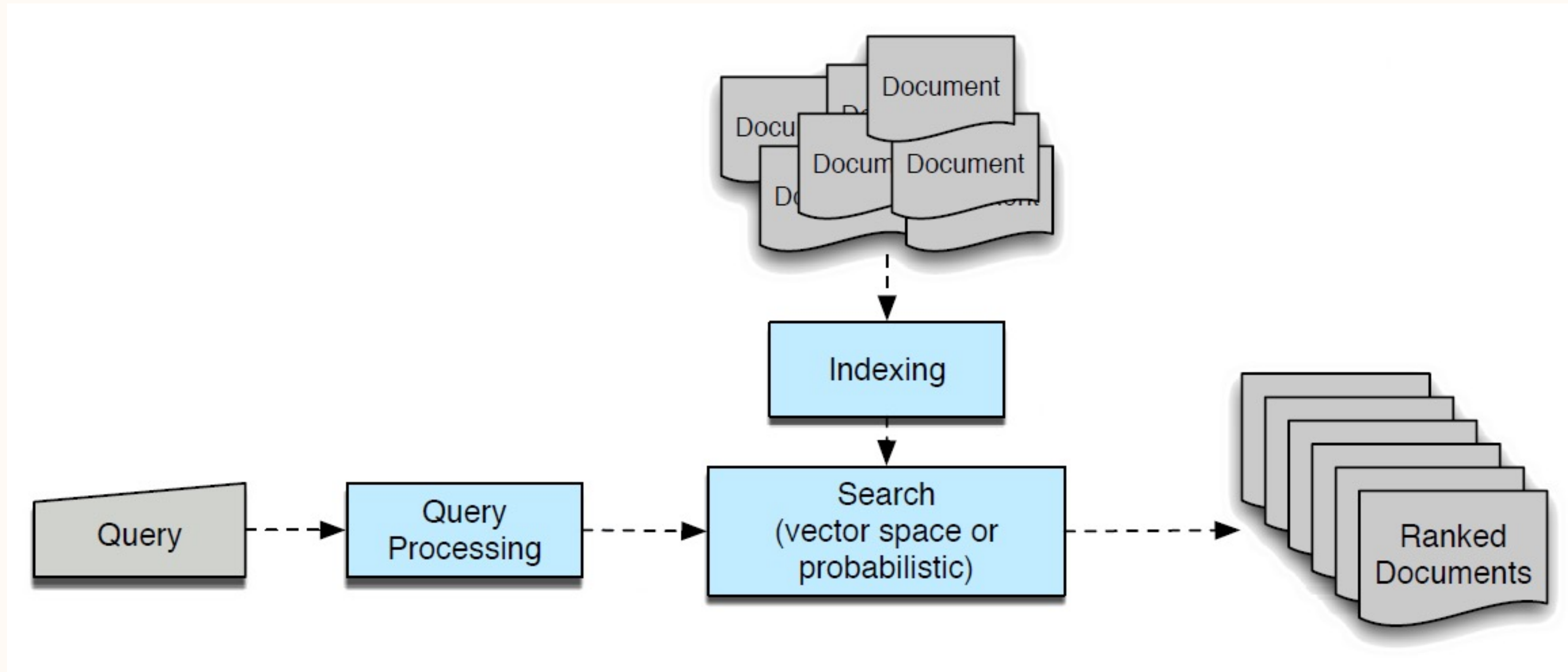
**Salary**  
\$188,000 - \$272,000 a year

**Job Type**  
Full-time

#### Benefits

Pulled from the full job description

# Classic Search & Recommendation Systems





## Existing Technology in Online Jobs Marketplace

- Text understanding: from bag-of-words, to entities, to embeddings
- Search-based architecture
- Sophisticated text matching
- Heavy feature engineering from user activity signals
- Learning to rank

# Existing Technology in Online Jobs Marketplace

Problem Solved?

# Existing Technology in Online Jobs Marketplace: Problem Case I

Recommending Janitors to Professors, or Vice Versa



# Existing Technology in Online Jobs Marketplace: Problem Case II

The screenshot displays a job marketplace interface. On the left is a sidebar with navigation options: My Jobs, Job Alerts, Salary, Skill Assessments, Interview Prep, Resume Builder, Job Seeker Guidance, and Application Settings. Below these is a button to 'Post a free job'. The main area is titled 'Recommended for you' and lists four job openings:

- Director of Engineering** at Mailchimp, San Francisco, CA (Remote). 1 company alumnus works here. 4 weeks ago, 6 applicants.
- Director, Engineering - Search** at Twitter, San Jose, CA. Actively recruiting. Promoted, 1 applicant.
- Director, Engineering** at Walmart, Sunnyvale, CA. Medical, 401(k), +1 benefit. 58 connections work here. Promoted.
- Director of Engineering, Search** at DoorDash, Mountain View, CA. Medical benefit. 14 connections work here. 17 hours ago, Apply easily.
- Director, Performance and Capacity Engineering** at Meta, Menlo Park, CA. 278 connections work here. Promoted, 3 applicants.

# Existing Technology in Online Jobs Marketplace: Problem Case III

The screenshot displays the LinkedIn job search interface. At the top, the search bar shows 'software engineer' and 'United States'. Below the search bar, there are filter buttons for 'Jobs', 'Date Posted', 'Experience Level', 'Company', 'Job Type', 'On-site/Remote', 'Easy Apply', and 'All filters'. The main content area is divided into two columns. The left column lists several job results, including 'Software Engineer (Leadership)' at Meta, 'Staff Software Engineer, Search Infrastructure' at LinkedIn, and 'Software Engineer, Vision' at Meta. The right column provides a detailed view of the 'Software Engineer (Leadership)' role at Meta, including the salary range (\$106,000/yr - \$198,000/yr), company size (10,001+ employees), and a list of responsibilities.

**Software Engineer (Leadership)**  
Meta · Los Angeles, CA (Remote) 37 minutes ago

\$106,000/yr - \$198,000/yr (LinkedIn est.) · Full-time

10,001+ employees · Internet

278 connections · 916 company alumni · 58 school alumni

Actively recruiting

[Apply](#) [Save](#)

Facebook's mission is to give people the power to build community and bring the world closer together. Through our family of apps and services, we're building a different kind of company that connects billions of people around the world, gives them ways to share what matters most to them, and helps bring people closer together. Whether we're creating new products or helping a small business expand its reach, people at Facebook are builders at heart. Our global teams are constantly iterating, solving problems, and working together to empower people around the world to build community and connect in meaningful ways. Together, we can help people build stronger communities - we're just getting started.

Facebook is seeking Technical Lead to join our engineering team. The ideal candidate will have industry experience working on a range of classification and optimization problems, e.g. payment fraud, click-through rate prediction, click-fraud detection, search ranking, text/sentiment classification, collaborative filtering/recommendation, or spam detection. The position will involve taking these skills and applying them to some of the most exciting and massive social data and prediction problems that exist on the web.

**Responsibilities**

- Drive the team's goals and technical direction to pursue opportunities that make your larger organization more efficient
- Understand industry & company-wide trends to help assess & develop new technologies
- Partner & collaborate with organization leaders to help improve the level of performance of the team & organization
- Suggest, collect and synthesize requirements and create an effective feature roadmap

# Existing Technology in Online Jobs Marketplace: Problem Case III

The image shows a Google search interface with the query "great resignation". The search results are displayed in a list format, each with a news source logo, a headline, a brief description, and a thumbnail image.

Google

great resignation

Q All News Videos Images Books More Tools

About 31,200,000 results (0.40 seconds)

**WTOP**  
**Montgomery County teachers union warning of a 'great resignation'**  
Montgomery County Education Association President Jennifer Martin is warning the Maryland school system is facing a "great resignation" if...  
5 hours ago

**CNBC**  
**The 'Great Resignation' could be an opportunity for a career reboot. These expert tips can help**  
High quit rates and record new job openings point to an employees' market. Here's how to make the most of it if you want to take time out to...  
2 days ago

**Deseret News**  
**'Great resignation' hitting restaurant industry hard. What's the solution?**  
Jalapeño's Bar and Grill in Boise may hold the key to keeping staff during a public health crisis.  
2 hours ago

**MarketWatch**  
**The panic over workers quitting? It's more Great Stalemate than Great Resignation**  
Worker expectations are up and employers haven't responded, and that's why companies are having trouble hiring. But the data on job openings...  
16 hours ago

## Existing Technology in Online Jobs Marketplace: Problems

- How to avoid “Professor-Janitor” problem?
- How to inspire career move?
- How to inspire location move or remote work?
- How do we know we are doing right things for the whole marketplace?
- How can we understand and incorporate market dynamics?

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# Computational Jobs Marketplace

- How to avoid “Professor-Janitor” problem?
- How to inspire career move?
- How to inspire location move or remote work?
- How do we know we are doing right things for the whole marketplace?
- How can we understand and incorporate market dynamics?

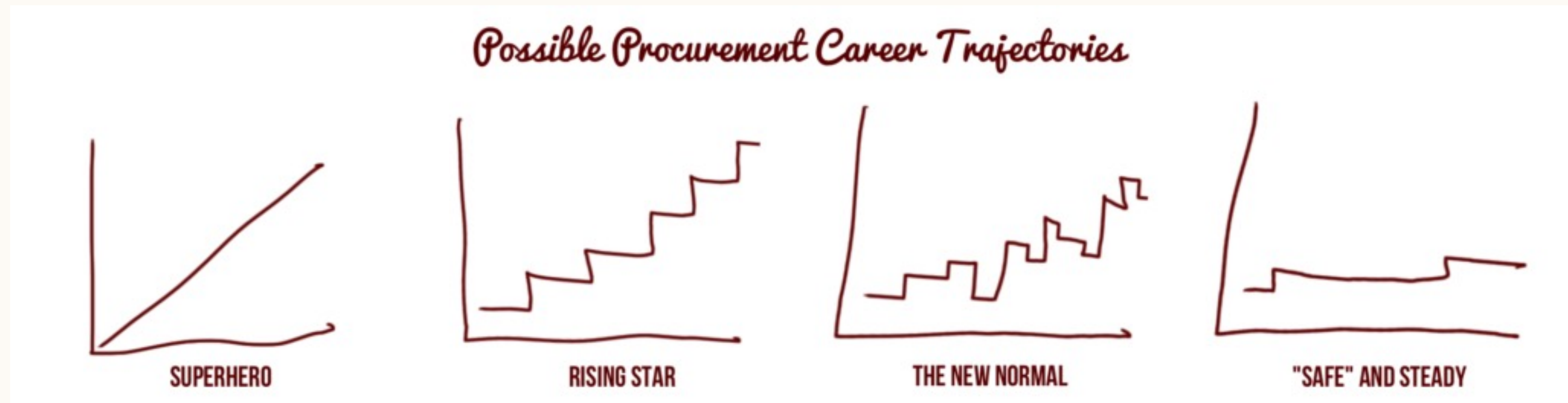
...

# Computational Jobs Marketplace

- Consider native properties of jobs marketplace
- Model marketplace dynamics from first principle

# Computational Jobs Marketplace: Opportunity I

## Understanding Career Trajectories



# Computational Jobs Marketplace: Opportunity I

Understanding Career Trajectories

Do we still need search-based solutions?

# Computational Jobs Marketplace: Opportunity II

## Understanding Skills



# Computational Jobs Marketplace: Opportunity III

## Understanding Mobility and Remote Work



# Computational Jobs Marketplace: Opportunity IV

## Modeling Demand & Supply



# Computational Jobs Marketplace: Opportunity IV

Modeling Demand & Supply  
Optimizing Marketplace Utilities





# Computational Jobs Marketplace

- Career Trajectories
- Skills
- Mobility and Remote Work
- Marketplace Dynamics

# Computational Jobs Marketplace



# Recap

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# The First International Workshop on Computational Jobs Marketplace

A WSDM 2022 Workshop

Welcome to **The First International Workshop on Computational Jobs Marketplace** to be held as part of **The 15th ACM International Conference on Web Search and Data Mining (WSDM 2022)**.

- **Date:** Feb 25, 2022
- **Location:** TBD

Online job marketplaces such as Indeed.com, CareerBuilder and LinkedIn Inc. have been helping millions of job seekers find their next jobs and thousands of corporations as well as institutions fill their opening positions. Along with the increase of market size, there has been a lot of interesting challenges in this domain, such as the drastic increase of work from home or remote work, the imbalance between the demand and supply of the job market, the popularity of independent workers, the capability of helping job seekers on their whole job seeking journey and career development, the different objectives and behaviors of all major stakeholders in the ecosystem, e.g. job seekers, employers, recruiters and job agents, to name just a few.

This workshop brings academic researchers and industry practitioners together to share early research results. We focus on the state of the art advances in the computational jobs marketplace.

## LIST OF TOPICS

<http://compjobs.github.io>

Thank you