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Methodology

**Document Purpose:**
- The current document aims to provide a view on the AI/ML and Big Data talent availability in two major talent hot-spots in the United States; SF Bay Area and Seattle.

**Methodology:**
- Standard desk research methodologies have been used to build the report. This document is built by bringing together available information gleaned from open, public sources with no intention of copyright violation. Due care has been exercised in crediting the original sources of information and/or research, wherever applicable.
- News, points of views, analyses, opinions and numbers from multiple public sources have been put together by analyzing them. We have also analysed publicly available reports published by prominent job boards such as Indeed, professional networking platform LinkedIn, workplace metrics aggregator Glassdoor and other open sources.

**Disclaimer:**
- Avance Consulting does not claim ownership or accuracy of the data derived from the original sources, presented in this document and takes no responsibility for any/potential loss arising out of using the information for decision-making.
Executive Summary

I. Global Talent Demand & Supply Dynamics

- Almost 50% of the global AI/Big Data positions were vacant in 2018. Where the global demand for AI/Big Data talent is ~1.2mn, the number of resources working globally is ~650K. US has the highest number of people with AI/Big Data skills who are employed at large corporations, Big Tech companies as well as start-ups. ~280K is the AI/Big Data talent pool in the US. However, US also had the highest number of unfilled jobs in 2018 – ~310K. Top recruiters in the US are JP Morgan, Amazon, Google, NVIDIA, Facebook, Intel and Microsoft.

- An estimated 450K jobs will be created in this space in 2021, up from 100K in 2018. However, this is also likely to result in unfilled positions due to demand supply mismatch.

II. Industry Hiring Trends - Top Employers

- US companies have invested US$1.35bn in hiring AI talent between April & September 2017; Microsoft has entered 2019 leading the AI patent race with 697 qualifications and is one of the top AI talent recruiters in the US today.

- Companies like Microsoft, Apple, Facebook are paying top dollars to on-board not only University graduates & Ph.Ds but also deep learning academics & scientists to man positions in research in AI labs and Centres of Excellence.

- The skill areas the companies are focusing on are Machine Learning, Deep Learning, Neural Networks, Cognitive Learning, Computer Vision and Reinforcement Learning along with a host of software development skills and programming languages notably Python, Java etc.

- While many roles pay top salaries, the average annual salary for a Deep Learning Architect can go beyond US$200K. Majority of the roles command salaries upwards of US$110K. Analysts feel this is the result of talent shortage and the willingness of the employers to pay higher salaries to add to their AI/ML talent pool. AI Engineer salaries at Uber, WalmartLabs, Facebook and Netflix have topped US$200K (Uber going above US$300K in annual salaries).

III. Location Deep-dive

- San Francisco, San Jose, NYC and Seattle are the AI/ML talent hotspots in the US while emerging hubs include Austin, Dallas, Boston and Atlanta. The Bay Area has ~110K and Seattle has ~63K people working in AI technologies.

- Microsoft and NVIDIA have more than 30% of their tech roles related to AI/ML technologies - the highest in the industry.

- Google, Apple, Facebook and Uber are the top recruiters in the Bay Area and more than 1/3rd of the roles are for Data Scientists; followed by Data Management Analysts.

- There are ~55K AI resources working in large corporations while the share of start-ups in the area is ~65K.

- San Francisco, San Jose, Mountain View, Santa Clara, Sunnyvale and San Mateo are top locations for talent availability. The median salary in the area is between US$195-US$200K.

- Enterprise software, cloud computing, gaming and consumer electronics are the verticals with the highest concentration of AI/ML talent.

- Seattle is the second city in the US in terms of AI/ML talent availability. The median salary offered in large corporations is ~US$185K and in start-ups it is ~100K. Microsoft, Amazon, Google and Facebook are the Big Tech companies hiring in this area whereas KenSci, Xnor.ai, Utrip are the start-ups hiring for AI/ML talent.

IV. AI/Big Data Talent in the US

- Recruiters in the US are hiring for talent in deep learning, machine learning, and computer visions skills.

- In 2017, US companies spent US$650mn in their AI/ML recruitment efforts and the average annual investment in AI talent surpassed US$33mn.

- San Francisco, San Jose, NYC and Seattle are the AI/ML talent hotspots in the US while emerging hubs include Austin, Dallas, Boston and Atlanta. The Bay Area has ~110K and Seattle has ~63K people working in AI technologies.

- Microsoft, Amazon, Google and Facebook are the Big Tech companies hiring in this area whereas KenSci, Xnor.ai, Utrip are the start-ups hiring for AI/ML talent.

V. Employer Profiles

- Amazon, Google, Facebook are the top employers in the AI/ML space globally and among them have a large concentration of available talent. One of the key characteristics of these companies, being product companies is to on-board top talent in their quest to provide better results on their respective platforms. However, the talent being limited, there is a real competition among these players to hire the best available talent. Apart from recruiting from each other, these companies are a regular feature at the developer conferences being held every year where they are known to make job offers to candidates. Almost all of their recruiting efforts for AI/ML/Big Data talent is spread across locations - the companies are opening research and innovation centers close to where the talent is. In 2019, most of them have strong recruiting plans and are looking to increase their respective talent pools. Universities in the US are also important recruiting places for these companies particularly in the backdrop of companies making job offers to academics and fresh Ph.D scholars in related technologies, apart from lateral hires with experience from the industry.
Section I: Employer Profiles
Employer Profiles (1/2)

Summaries

**Apple**
Traditionally Apple has been slow in making its mark in AI as it has neither access to data nor did it have the requisite research talent and resources to approach AI development.

However, it changed its AI/ML strategy by hiring John Giannandrea to lead its AI and Machine Learning efforts in 2018. Also hired Ian Goodfellow as Director of Machine Learning. With 2 high-profile hires from Google, Apple has upped its game to attract top AI talent.

Since 2015, Apple has doubled the number of AI and related professionals on its rolls and has tripled the number of Ph.Ds.

Apple’s strategy to on-board high-end talent involves recruiting from Amazon and Microsoft, considered to be among the leaders in the global AI/ML space. It also hires professionals from eBay and Yahoo.

According to a research conducted by RS Components, Apple has made it to the list of top 20 companies hiring for AI talent.

Recent moves demonstrate Apple’s greater focus on making AI part of its product R&D work.

**Amazon**
Uses AI to improve search results, offer better product recommendations, and improve its forecasting and inventory management.

Plans to expand AI research and has opened a new R&D centre in Barcelona, Spain and would employ 100 scientists and software engineers. Amazon is looking for AI talent across locations to fuel its products. Similarly, opened another R&D center in Cambridge, England which houses 400 Machine Learning Scientists, Knowledge Engineers, Modelers, and Speech Scientists.

Made an endowment of US$10mn to the University of Washington that serves both as investment in AI and Machine Learning talent and commercial technologies as well as donation. The University is one of the top sources for AI talent for Amazon. This coincides with its hiring spree for its Alexa Group.

Has recently announced its intention to hire 25,000 tech professionals for each of its two mega offices, called H2Q in NYC and Virginia. This is on the back of its decision to deploy 10,000 professionals on its voice-activated digital system - Alexa.

**Google**
Google has acquired Kaggle - a crowdsourcing platform for predictive modeling and machine learning competitions. This enables Google to access 6,000,000 data scientists in a very talent-strapped market. This acquisition helps Google to further its efforts in natural language processing, predictive analytics, and machine learning tools.

Investing in education and training: Has recently invested $4.5mn in the Montreal Institute for Learning Algorithms, a research lab at the University of Montreal. This doubles down its efforts to be a part of the training ecosystem which is a source for potential talent.

Google (DeepMind) has stiff competition with Facebook for AI talent which the former acquired for US$400mn.

Has been using AI to power its internal talent deployment platform that sits at the centre of gTech, the company’s support and operations division.

In Jan, 2019 Google launched a new office in Berlin, Germany for a new set of artificial intelligence researchers and engineers. They are working on basic research and deep learning technologies.

Sources: Company pages and open sources
## Employer Profiles (2/2)

### Summaries

<table>
<thead>
<tr>
<th><strong>Tesla</strong></th>
<th><strong>IBM</strong></th>
<th><strong>Accenture</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tesla is working to build its own hardware. Tesla's AI will build the algorithm for its 'Autopilot' software. Faces competition for talent from Apple and Google for electric and autonomous vehicle talent. Tesla and Apple have been hiring from each other's ranks. Tesla has grown its AI talent organically unlike some of its competitors. Has hired Andrej Karpathy, from OpenAI, as the new Director for Artificial Intelligence.</td>
<td>IBM aims to rope in developers across domains to expand its work on its platforms and services, particularly Watson-based AI services. Participates in Developer Conferences (Index Developer Conference, San Francisco) to scout for talent. Along with MIT, IBM launched 48 projects in 2018 to tackle AI challenges - its 10-year US$240mn program 'MIT-IBM Watson AI Lab' has 100 scientists working on different projects. 60 scientists are from MIT and 40 are from IBM. The idea of the collaboration is to incubate AI talent to address talent gaps and shortages. The four areas of research include: advanced algorithms, specialized hardware for AI, industry uses of AI technologies such as healthcare and security and AI for social and economic use. IBM started building its Data Science Elite Team two years back - now headed by Seth Dobrin. The team work with clients in 6-12 weeks engagements to collaborate on data science and AI projects. The team consists of 60 data scientists, machine learning experts - the team is planning to hire 30 new data scientists this year (2019).</td>
<td>Accenture has in 2017 filled 500 positions in the UK in areas such as Robotics, Artificial Intelligence and Virtual Reality. Accelerating its AI R&amp;D across its global network of Accenture Technology Labs. Opened a new centre in Dublin 'Centre for Innovation' to further its efforts in analytics, cognitive computing and machine learning systems. Its Technology Labs in San Jose and Arlington hire AI/ML talent. In April, 2019, Accenture launched Accenture Federal Services (AFS) at San Antonio, Texas - which employs a team of inter-disciplinary experts including in AI-based cyber-intelligence. The Cyber Centre is part of larger AFS expansion in San Antonio which will witness new investments of US$5mn and add 500 jobs over the next 2-3 years. In 2018, Accenture acquired Kogentix which added to its Applied Intelligence's talent bench of more than 6,000 data and AI professionals. In 2017, it acquired Search Technologies and on-boarded 200 Big Data engineers and search experts in to its Applied Intelligence practice.</td>
</tr>
</tbody>
</table>
Section II:
Global & US Talent Demand & Supply Dynamics
Global AI/Big Data demand & supply

Almost 50% of global AI/Big Data positions were vacant as of 2018 indicating demand for talent outstrips supply; US has the highest concentration of AI/Big Data talent at ~280K

Global demand for AI/Big Data Talent 2018

~1.2mn

Global unmet demand in 2018

~515K*
taken to be equivalent to AI/Big Data job openings worldwide

- AI/ML talent in the US is predominantly placed within large corporations including Big Tech companies and start-ups. Companies such as Google, Amazon, Facebook, Microsoft and IBM have large installed talent pools. Smaller tech-focused companies who are at the forefront of hiring AI/ML talent are Splunk, Cloudera and MongoDB
- To fill positions, companies are initiating large-scale talent development programs such as skill development through in-house academies and course modules. In the future, successful recruiters will be able to meet the demand by directly collaborating with basecamps, universities and other educational and training organizations.

Sources: DRAUP, Secondary sources. *Global 500 companies (top 500 companies based on R&D spend), the numbers shown are indicative only and are based on a study conducted by DRAUP
Global AI/Big Data Job Projection

According to a research by Indeed, demand for AI talent have more than doubled in the past 3 years, the three most sought-after job roles on the market are Data Scientist, Software Engineer, and Machine Learning Engineer.

New job creation in AI will reach 450K in 2021, but will also create unfilled positions...

Growth in AI/Big Data Jobs

Unfilled positions - 2018 (total 515K worldwide)

Sources: DRAUP, other Secondary sources, the numbers are indicative only, all the regions have not been shown the numbers shown are indicative only and are based on a study conducted by DRAUP (Powered by Zinnov)
## Skills Overview

Software Engineering skills are in demand mostly for AI/ML developer roles; candidates with niche skills such as NLP, Deep Learning and Computer Vision draw the highest average salaries.

### Top Skills in demand

- Artificial Intelligence
- Deep Learning
- Reinforcement Learning
- Machine Learning
- Computer Vision
- JAVA
- C++
- Neural Networks
- Software Development
- Linux
- Python

### Role vs. Average Annual Salary

<table>
<thead>
<tr>
<th>Role</th>
<th>Average Annual Salary</th>
<th>Role</th>
<th>Average Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td><strong>Seattle</strong></td>
<td><strong>Overall</strong></td>
<td><strong>Seattle</strong></td>
</tr>
<tr>
<td>AI Specialist</td>
<td>US$105,918</td>
<td>NLP Scientist R&amp;D</td>
<td>US$74,697</td>
</tr>
<tr>
<td>AI Analyst</td>
<td>US$82,568</td>
<td>NLP Engineer</td>
<td>US$92,634</td>
</tr>
<tr>
<td>AI Developer</td>
<td>US$72,283</td>
<td>NLP Developer</td>
<td>US$83,724</td>
</tr>
<tr>
<td>AI Software Engineer</td>
<td>US$123,495</td>
<td>NLP Researcher Lead</td>
<td>US$138,493</td>
</tr>
<tr>
<td>AI Leader</td>
<td>US$104,353</td>
<td>NLP Application Engineer</td>
<td>US$131,877</td>
</tr>
<tr>
<td>Machine Learning Engineer</td>
<td>US$94,510</td>
<td>Deep Learning Engineer</td>
<td>US$84,388</td>
</tr>
<tr>
<td>ML Scientist</td>
<td>US$107,062</td>
<td>Deep Learning - Architect</td>
<td>US$213,690</td>
</tr>
<tr>
<td>ML Researcher</td>
<td>US$79,646</td>
<td>NLP Research Engineer</td>
<td>US$88,633</td>
</tr>
<tr>
<td>ML Developer</td>
<td>US$75,465</td>
<td>Research Scientist</td>
<td>US$86,776</td>
</tr>
<tr>
<td>ML Lead Scientist</td>
<td>US$132,539</td>
<td>Deep Learning Specialist</td>
<td>US$84,950</td>
</tr>
<tr>
<td>Computer Vision Engineer</td>
<td>US$90,151</td>
<td>Robotics Vision Engineer</td>
<td>US$90,770</td>
</tr>
<tr>
<td>Computer Vision - R&amp;D Scientist</td>
<td>US$98,429</td>
<td>Computer Vision Researcher</td>
<td>US$81,777</td>
</tr>
<tr>
<td>Computer Vision - Ph.D Graduate</td>
<td>US$48,189</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Sources: www.paysa.com, the size difference of the skills boxes is owing to the relative skill demand, the salaries have been extracted from Paysa as on 04/19/19.
Section III:

Industry Hiring Trends
Top Employers
Industry Overview - top investments in hiring AI talent in the US

US companies have invested US$1.35bn in hiring AI talent between April & September 2017; Microsoft has entered 2019 leading the AI patent race with 697 qualifications and is one of the top AI talent recruiters in the US today.

**Big Tech**

- **Investment**: US$305mn
  - One of the global leaders in AI/ML, powers most of Amazon.com. Uses AI as the foundation of its customer recommendations, logistics capabilities, smart speakers.
  - Plans to hire 100 scientists for its new AI hub in Barcelona, Spain.

- **Investment**: US$124mn
  - Another top employer hiring AI talent worldwide, Microsoft is scouting for skilled people at conferences it participates in and also through sponsoring tech education at universities. Hosted an AI conference (NIPS) in LA from which it had hired AI professionals.
  - Works with major US universities to fuel the talent pipeline - it is a major sponsor of Master's Programme at Cambridge - has funded 200 Ph.D scholars at the University.
  - Has set up an internal AI University to train its resources.

- **Investment**: US$105mn
  - Apple has recently hired Google's AI scientist Ian Goodfellow (Generative Adversarial Networks fame) to lead its Machine Learning practice, part of the 'special projects' group. Earlier it had hired John Giannandrea to lead AI/ML strategy. Made 3 AI-related acquisitions in 2018 - Laserlike, Silk Labs, Asaii.
  - In 2017, Apple had more than 600 people who are specialized in Machine Learning, Computer Vision, and NLP.

**Financial Services**

- **Investment**: US$15.4mn
  - 40% of the bank's US$10.8bn is spent on new initiatives - AI, RPA & Blockchain for building platforms. New Palo Alto facility will house 1,000 engineers and AI experts. Held AI Open Hiring event in California (Feb, 2019)
  - Hired Apoorv Saxena, Google's former head of product for cloud-based AI, will head the bank's AI/ML services; also hired the Head of Carnegie Mellon's Machine Learning Department, Manuela Veloso.

- **Investment**: US$14.6mn
  - Has unveiled a new Tech incubator on the University of Maryland campus, as a part of its strategy to invest in ML and other technologies in the Greater Washington region. Developing its chatbot, Ena. Opened the 'Centre for Machine Learning, which is part of the company-wide effort to recruit AI talent.
  - Since 2017, it has been training its employees on technologies including ML. The talent program is called 'Tech College': 350 employees has signed up for the six-month programme on ML.

**Consulting**

- **Investment**: US$21.8mn
  - Building a new 'Tech Hub' in Dayton, Ohio creating 60 new jobs in data science, cybersecurity, AI, data analytics. Teamed up with NVIDIA to offer a series of courses on AI.

- **Investment**: US$4.6mn
  - Deloitte has recently acquired the AI business of New York-based Magnetic Media Online, signaling the importance of investments in AI, ML and audience data analytics. The acqui-hire resulted in the joining of Magnetic's product & engineering employees in Deloitte's Digital Experiences Services Group.
  - Has invested more than US$1bn worldwide to build advanced audit quality which includes Omnia, Deloitte's cloud-based AI platform.

Sources: Secondary sources, * denotes investment in AI talent hiring made between April & September, 2017. The information is not exhaustive.
Industry Overview - other top players

Companies like Microsoft, Apple, Facebook are paying top dollars to onboard not only University graduates & Ph.Ds but also deep learning academics & scientists to man positions in research in AI labs and Centres of Excellence

**Technology**

**IBM**
- **Investment**: US$12.2mn
- Started a massive training push within IBM, being executed by its in-house AI Skills Academy. It is also investing a big chunk of its US$500mn annual training budget in AI. Reskilling programs are a top priority at IBM to deal with AI talent shortage
- IBM is focusing on hiring more developers, particularly for its Watson-based AI services. Has tied-up with Unity Technologies, a game development platform provider to extend its AI services to the developer communities to integrate cloud Watson

**Intuit**
- **Investment**: NA
- To double the team size at Facebook Artificial Intelligence Research (FAIR) from the current 180-200 to about 400 people by 2020. Has AI research staff in Menlo Park, New York, Seattle and Pittsburgh. Hired Luke Zettlemoyer from University of Washington
- Hiring specialists who can search image libraries, process varying languages, and analyze human motion
- Led by global expansion, Facebook is a regular at top universities and other places where researchers & academics work

**NVIDIA**
- **Investment**: US$22.3
- NVIDIA runs a program at the San Jose State University to impart training in AI to graduate students, working with 20 top global universities to nurture and incubate AI talent. It also has the Deep Learning Institute to train software developers
- Has invested US$40mn in AI start-up H2O.ai for global expansion and innovation of 'Driverless AI'
- Building an AI ecosystem of partners, companies and developers. It trained 100,000 people in AI 2017 onwards

**Others**

**Salesforce**
- **Investment**: US$7.2mn
- Since incorporating AI in to its products and operations, Salesforce has predominantly built its talent through acqui-hires (through a string of acquisitions) - BeyondCore, Implit Insights, MinHash, Demandware & Krux
- New research center in Singapore to train 100 post-graduate resources in AI including in deep learning and natural language processing. Salesforce had earlier crowdsourced efforts to build AI applications on its platform through a US$50mn fund (2017)

**Salesforce**
- **Investment**: US$28.3mn
- Has chosen AWS as its standard for Machine Learning, and AI workloads.
- Intuit has a large requirement for Java professionals and is one of the basic requirements on the resume of a potential candidate. Plans to build a pipeline of talent for future needs, looking to hire Art graduates too and establishing outreach to universities
- 40 AI/ML features pack Intuit’s products and will use AWS to further develop and deploy its capabilities at scale

**NVIDIA**
- **Investment**: US$6.6mn
- Zoubin Ghahramani heads Uber’s inhouse AI research arm. Acquired Geometric Intelligence, an AI start-up. 15 people came on-board at Uber.
- Has AI talent needs for its Advanced Technologies Centre, home to Uber’s self-driving car research. Earlier, in 2015 it had hired 50 researchers from Carnegie Mellon’s AI program

Sources: Secondary sources, * denotes investment in AI talent hiring made between April & September, 2017. The information is not exhaustive
Salary trends - top employers

While the highest salaries are paid by product majors/big-tech firms, mature platform start-ups with cross industry focus have also been able to successfully attract top AI talent - particularly on the West Coast.

As per Paysa.com, a career service and salary insights provider, the average annual salary of an AI Engineer works out to be US$241,145; wide variations also exist as shown below....
Acqui-hires

Of the 120 AI start-ups exited in 2017, 115 were acquired, indicating a growing competition for AI talent; FAANG - Facebook, Apple, Amazon, Netflix and Google lead the global AI talent acquisition race.

Acqui-hire provides an opportunity for the acquiring companies to quickly shore up capabilities, add new features to their products and strengthen their AI talent pool...

- Acqui-hires have emerged as a strong alternative to traditional modes of hiring - job boards, employee references, or campus hires. The trend has been picked up by almost all Big-Techs around the world. This involves shoring up the product portfolio of the acquiring company and also integrating the people resources working in the acquired entities. Companies like Google, Amazon, Facebook and Apple are the biggest players both in AI as well as in the AI M&A space. They are often quick to snag up vertical or horizontal AI start-ups who can provide incremental value as well as boost the company's tech talent bench.
- Google's US$1bn acquisition of Deep Mind in 2014 and Api.ai in 2017 were among the biggest acquisitions in the AI space. Apple made a US$200 acquisition of Seattle-based start-up, Turi that helps developers and universities use machine learning for data analysis. In 2016, Twitter paid US$150mn for a 14-people start-up Magic Pony, a UK-based AI Visual Search company. At US$10mn/employee this has been one of the most expensive acqui-hires in recent times.
- Some of the biggest advantages of onboarding talent through acquisitions is they are less likely to need training and are already working on cutting-edge projects and technologies and are familiar with frameworks and stacks.

Sources: CB Insights, other secondary sources. The timeline are indicative only and does not reflect all the acquisitions made by these companies. Only notable ones are mentioned.
Section IV:
AI/Big Data Talent In The US
US - AI and Big Data Talent Overview

Big Data Analytics & AI talent in the United States is mostly concentrated within the US-based tech giants - typically led by Facebook, Google, Amazon, Microsoft and IBM.

US has multiple Tier 1 locations both in terms of job and talent availability; Bay Area is the biggest hub.

US Big Data & AI Talent Pool (By Employer Type)

Total talent pool >280,000
~110K in Global Top 500*, ~160K in Tech start-ups and ~10K-15K at SIs/providers

Evolving market
While the major chunk of resources are employed at Big Techs, new mid-market players are also hiring top talent - MongoDB, Cloudera, Splunk

In the US, tech-giants alone account for ~44% of the global talent pool (Top 500 spenders)
Located in Tier-1 US cities, Seattle (~27,000), Bay Area (~56,000), Boston (~5,000) & New York (10,000)

The US has >5,750 Big Data & AI start-ups employing ~120K people in Western US and ~40K in Eastern US

Top AI Employers (average net salary, Apr 2017)

Deep Learning
Advertising, Disease Detection, Speech Recognition, ...

Machine Learning
Online Sales, Google Brain

Computer Vision
Maps, handwriting recognition, Autonomous Vehicles

Neural Networks
Advertising, Customer Service, Robotic Advisors

Regional View: Investments in AI Tech Talent & Salaries (US, 2017)

West
Average Salary: US$157,335
Total Investment: US$1.1bn

Mid West
Average Salary: US$102,861
Total Investment: US$12.65bn

South
Average Salary: US$103,610
Total Investment: US$84.4mn

North East
Average Salary: US$116,008
Total Investment: US$289.45bn

Sources: 1Zinnov DRAUP, 2018, *Top R&D spenders, 2www.paysa.com (April, 2017), Top employers of AI talent in the US
Share in the Pie: AI positions Vs. Overall Tech Positions

The share of AI jobs is rising steadily owing to large-scale adoption & assimilation of new technologies within product lines; Microsoft is looking to hire ~2,000 AI resources globally, AI jobs constitute a 3rd of NVIDIA’s total job adverts

Demand for AI talent has rapidly increased; AI-related roles have doubled in the past 3 years. Job postings with AI requirements has also increased as a percentage of overall jobs...

<table>
<thead>
<tr>
<th>Company</th>
<th>AI Jobs as a % of all IT Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft</td>
<td>36.3%</td>
</tr>
<tr>
<td>NVIDIA</td>
<td>36.3%</td>
</tr>
<tr>
<td>Google</td>
<td>36.3%</td>
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<tr>
<td>Intel</td>
<td>36.3%</td>
</tr>
<tr>
<td>SAP</td>
<td>36.3%</td>
</tr>
<tr>
<td>Accenture</td>
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<td>Facebook</td>
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<tr>
<td>Apple</td>
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<tr>
<td>Amazon</td>
<td>2.1%</td>
</tr>
<tr>
<td>IBM</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Key Takeaways

- The above illustrates the incidence of AI jobs at each company, based on a research conducted by RS Components in 2018-2019.
- According to the research, Microsoft is at the top of the AI talent hunt globally looking to fill upwards of 2,000 dedicated AI positions. Almost 36% of all IT jobs (5,440) listed at Microsoft are AI jobs. This is also corroborated by the fact that beginning 2019, Microsoft leads the pack with 697 world-class AI patents.
- Closely following is graphics chip developer - NVIDIA. 1 in every 3 tech jobs at the company is an AI job totaling 369.
- Other large players closely associated with hiring top AI talent globally are Google, Facebook, Apple, IBM etc.
- Apple has more than doubled its AI headcount since 2014 and has grown 3 times in terms of the number of Ph.D holders on its payroll. Within the tech sector, both Amazon and Microsoft are Apple's top hiring sources. While it hires upwards of 21% of its AI talent from the government sector or academics, 10.1% of its AI talent comes from acquisitions. The majority however, comes from the competition.

Sources: RS Components
### AI and Big Data talent concentration in the US - by entities

In the race to net AI talent, large tech companies are paying top salaries to academics, researchers and Ph.Ds from select local universities.

#### AI/Data Science talent spread across tech companies, Start-ups and University departments....

<table>
<thead>
<tr>
<th>Entity type</th>
<th>Key takeaway</th>
<th>Companies/Univ.</th>
<th>Market Highlights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Technology</td>
<td>Typically large spenders in AI and related technologies. Employ large-scale</td>
<td>a twitter san francisco</td>
<td>~25,000 AI/BD engineers employed</td>
</tr>
<tr>
<td>companies - mostly US</td>
<td>AI/Big Data talent concentrated in Tier-1 locations across the country.</td>
<td>facebook UBER</td>
<td>100+ acquisitions made globally</td>
</tr>
<tr>
<td>headquartered</td>
<td>Invariably pay the top salaries in the market</td>
<td></td>
<td>US$25bn AI/BD spend annually</td>
</tr>
<tr>
<td>Mature start-ups</td>
<td>Mature platform start-ups with investments upwards of US$100mn catering</td>
<td>sentient kensci</td>
<td>AI start-ups with capabilities around Core AI, Computer Vision, Natural Language</td>
</tr>
<tr>
<td>in the AI space</td>
<td>to a wide variety of industries - retail, healthcare, cybersecurity,</td>
<td>Q Palantir</td>
<td>Processing and Data Science have sizable AI talent pool. US has more than ~1,500</td>
</tr>
<tr>
<td></td>
<td>FinTech</td>
<td></td>
<td>AI start-ups in the Bay Area and ~120 in Seattle area. While the start-ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>have hired heavily from enterprise software giants, Amazon &amp; Microsoft in turn</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>have hired mid-level AI talent from service providers - TCS, IBM and Accenture</td>
</tr>
<tr>
<td>Top Universities</td>
<td>MIT, NYU, and Stanford University are the favorite hunting ground for</td>
<td>Caltech UCLA</td>
<td>20+ Tier-1 Universities running AI and ML</td>
</tr>
<tr>
<td>(scholars + academics)</td>
<td>employers of AI talent. Individually these universities produce ~2,500 AI/ML</td>
<td>UCSD Waterloo</td>
<td>courses at various levels</td>
</tr>
<tr>
<td></td>
<td>talent every year. Other universities include Caltech, University of</td>
<td>Berkeley Haas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waterloo and UCB</td>
<td></td>
<td><strong>Recent hires</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rob Fergus (NYU) - Facebook</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Uber hired 40 researchers from Carnegie Mellon’s AI program in 2015 which dealt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>with self-driving cars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Facebook hired Yann LeCun from NYU currently Director of AI Research at Facebook</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fei-Fei Li hired by Google (from Stanford University)</td>
</tr>
</tbody>
</table>
AI and Big Data talent concentration in the US - by regions

Both tech companies and start-ups have large pools of AI & Big Data talent on the West Coast, in the southern and eastern regions the concentration of talent is higher within start-ups.

There are regional variations in terms of the concentration of mature AI talent; Bay Area and Seattle together account for more than 61% of US’ Big Data and AI talent.

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Talent Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay Area</td>
<td>110K+</td>
</tr>
<tr>
<td>Seattle</td>
<td>63K+</td>
</tr>
<tr>
<td>Dallas</td>
<td>17K+</td>
</tr>
<tr>
<td>Boston</td>
<td>35K+</td>
</tr>
<tr>
<td>Phoenix</td>
<td>9K+</td>
</tr>
<tr>
<td>Austin</td>
<td>10K+</td>
</tr>
</tbody>
</table>

Sources: www.paysa.com, Avance Consulting internal analysis DRAUP - Talent Simulation Module
Section V: Location Deep-dive
Location Analysis - Bay Area

In the Bay Area both big technology companies and well-funded start-ups vie for AI talent; median salaries have topped US$195K-200K; Data Science is one of common roles with emphasis on building cross-industry AI platforms.

More than 65,000 resources work in ~1,500 start-ups operating in the Bay Area; enterprise software, cloud computing, semi-conductor, gaming and consumer electronics are the key verticals ....

## Bay Area - AI/Big Data Talent

**Total available talent**

~110K-120K

**Talent pool:**

- In large companies ~55K
- In start-ups ~65K

**Median Salary**

US$195K-US$200K

### Talent Hubs

<table>
<thead>
<tr>
<th></th>
<th>Tech Companies</th>
<th>Start-ups</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>Uber</td>
<td>Sentient, Anki, Vicarious, Figure Eight</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>Tesla, SAP, SalesforceIQ</td>
<td>Pr3vent, Conversica, Autolab AI</td>
</tr>
<tr>
<td>Mountain View</td>
<td>Google</td>
<td>Datavisor Inc., Nuro</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>Apple (Cupertino)</td>
<td>SoundHound Inc.</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>Yahoo Inc.</td>
<td>CrowdStrike</td>
</tr>
<tr>
<td>San Jose</td>
<td>Adobe, MapR</td>
<td>Pony.ai, AppZen</td>
</tr>
<tr>
<td>San Mateo</td>
<td>Facebook (Menlo Park)</td>
<td>Brain Corp.</td>
</tr>
</tbody>
</table>

### Recruitment dynamics in the region

#### Key employers in the region

- Corporations, Big Techs, AI-focused start-ups. Strong competition for top AI talent between large companies and start-ups

#### Start-ups

- Approximately 1,500 AI start-ups operate from Bay Area and are one of the lucrative destinations for AI talent. Operating in 4 key technology areas within AI - Core AI, Computer Vision, NLP and Data Science. Platform start-ups with strong VC backing are hiring laterally from tech giants like Adobe, Google, and Microsoft.

#### Universities

- There are 10 universities in the region which churn out sizable number of potential recruits both at a graduate as well as doctoral level.
  - Top universities include Stanford University, University of California - Berkeley, California Institute of Technology, Carnegie Mellon

### Headcount by skills

- Data Scientist: 35%
- Data Management Analyst: 11%
- Database Engineering: 10%
- Data Architect: 8%
- Applied AI: 3%

### Ex-employee analysis

- Past experience:
  - Hiring company: Google, IBM, Amazon, Apple, Intel, Yahoo, Samsung, Facebook, LinkedIn, Twitter, IBM, Adobe, Microsoft, Adobe, MapR, Pony.ai, AppZen
Top 5 employers of AI/Big Data - Bay Area

Google and Facebook have hired experienced engineers from peer tech companies many of whom are graduates of Tier 1 US universities; Apple and Uber have hired from Microsoft as well as from Google.

Top 5 large tech companies hiring AI talent in the Bay Area have close to 12,000 people working on various projects....

<table>
<thead>
<tr>
<th>Top 5 Employers</th>
<th>Headcount: 12K</th>
<th>Data Scientist</th>
<th>Database Engineer</th>
<th>Applied AI</th>
<th>Data Architect</th>
<th>Data Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>~4,600</td>
<td>~3,036</td>
<td>~736</td>
<td>~138</td>
<td>~184</td>
<td>~506</td>
</tr>
<tr>
<td>Facebook</td>
<td>~2,000</td>
<td>~1,280</td>
<td>~500</td>
<td>~40</td>
<td>~80</td>
<td>~100</td>
</tr>
<tr>
<td>Apple</td>
<td>~3,000</td>
<td>~1,680</td>
<td>~480</td>
<td>~180</td>
<td>~180</td>
<td>~480</td>
</tr>
<tr>
<td>Uber</td>
<td>~1,200</td>
<td>~936</td>
<td>~180</td>
<td>~12</td>
<td>~24</td>
<td>~48</td>
</tr>
<tr>
<td>Oracle</td>
<td>~1,000</td>
<td>~210</td>
<td>~100</td>
<td>~10</td>
<td>~100</td>
<td>~580</td>
</tr>
</tbody>
</table>

Key Takeaways:

- Facebook's key AI product priorities across DeepText, facial recognition, Oculus Advanced Development Group, Instagram and Whatsapp are based out of the Bay Area. Hired Jerome Pesenti as VP of AI. Competes for talent with tech giants such as Amazon and Google's DeepMind.
- Apple's headquarters in the region employs 80% of its R&D talent. Core ML teams from Siri, Developer's platform, iOS, iCloud etc. are also based out of this centre. Working to discard the laggard tag in terms of investments in AI/ML with new hires to lead AI/ML research.

Sources: Desk research, DRAUP
Location Analysis - Seattle
Has the second largest concentration of AI talent after the Bay Area; majority of the talent are in Data Management & Data Scientist roles in large global corporations including tech companies as well as in industry/vertical-specific start-ups

While Seattle has been the area of competition for major cloud providers such as Microsoft and Amazon, it has turned in to an AI/ML hub....

Seattle - AI/Big Data Talent

- Total available talent ~63K-65K
- Talent pool:
  - In large companies ~27K
  - In start-ups ~36K
- Median Salary
  - US$185K (Big Tech)
  - US$100K (Start-ups)

Seattle - AI/Big Data Talent

<table>
<thead>
<tr>
<th>Talent Hubs</th>
<th>Tech Companies</th>
<th>Start-ups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seattle</td>
<td>Microsoft</td>
<td>Amazon</td>
</tr>
<tr>
<td></td>
<td>Amazon</td>
<td>Facebook</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Google</td>
</tr>
<tr>
<td>Belle Vue</td>
<td>Utrip</td>
<td>Mighty AI</td>
</tr>
<tr>
<td></td>
<td>TenSci</td>
<td>XNOR.AI</td>
</tr>
</tbody>
</table>

Recruitment dynamics in the region

- **Key employers in the region**
  - Microsoft Azure ML Lab, Facebook Deep Learning, and Amazon Core NLP teams are based out of Seattle and have high concentration of Data Scientists. Tencent has opened an AI research center at Belle Vue with 20 specialists. Baidu also opened a center after acquiring Kitt.ai.
  - Amazon continues to invest in Alexa while Microsoft has been making newer investments in AI.

- **Start-ups**
  - There are an estimated ~120-150 AI start-ups operating in Seattle region. Vibrant and growing ecosystem - new NLP start-ups such as Textio, DefinedCrowd, Mighty AI, Vettd

- **Universities**
  - Dan Weld, from the University of Washington has been hired by The Allen Institute for Artificial Intelligence.

Sources: Desk research, DRAUP
TALENTSPECTRA is the advisory and insights team of Avance Consulting, a world-class provider of innovative talent acquisition solutions and Executive search services. With a global presence in the UK, US and India, it brings together a decade-long experience in recruitment best practices matched by a strong service delivery ethos.

Continuous evolution of Digital business models has disrupted the existing norms; new roles are being created while old ones are becoming redundant. Hiring methodologies are changing and re-skilling initiatives have taken the centre stage. Automation, Cloud & Cybersecurity, IoT and Immersive Technologies are driving the next round of change. Businesses are becoming more customer-centric and decision-making being driven by Data.

Amidst this transformation, we aim to partner with our customers and stakeholders in their recruiting journey by providing them with information and analyses pertaining to talent acquisition; combining the dimensions of Business, Technology and Skills. Backed by a strong understanding of Digital Technologies and global IT landscape, TALENTSPECTRA is the right partner to assist you in your day-to-day decision-making.

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