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AI Hubs in the United States

CSET Data Brief

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With the increasing importance of artificial intelligence and the competition for AI talent, it is essential to understand the U.S. domestic industrial AI landscape. To this end, we mapped where AI talent is produced, where it concentrates, and where AI equity funding goes. This mapping shows distinct AI hubs emerging across the country, with different growth rates, investment levels, and potential access to talent. Talent production, talent employment, and investment are not fully aligned, possibly informing the talent shortage in Silicon Valley and highlighting the opportunity for innovative hubs to develop throughout the nation. The mapping also reveals that, while investment is split along the West and East Coasts, Chinese investment—though modest overall—is concentrated in Silicon Valley.

Figure 1. Industrial Talent and Talent Growth

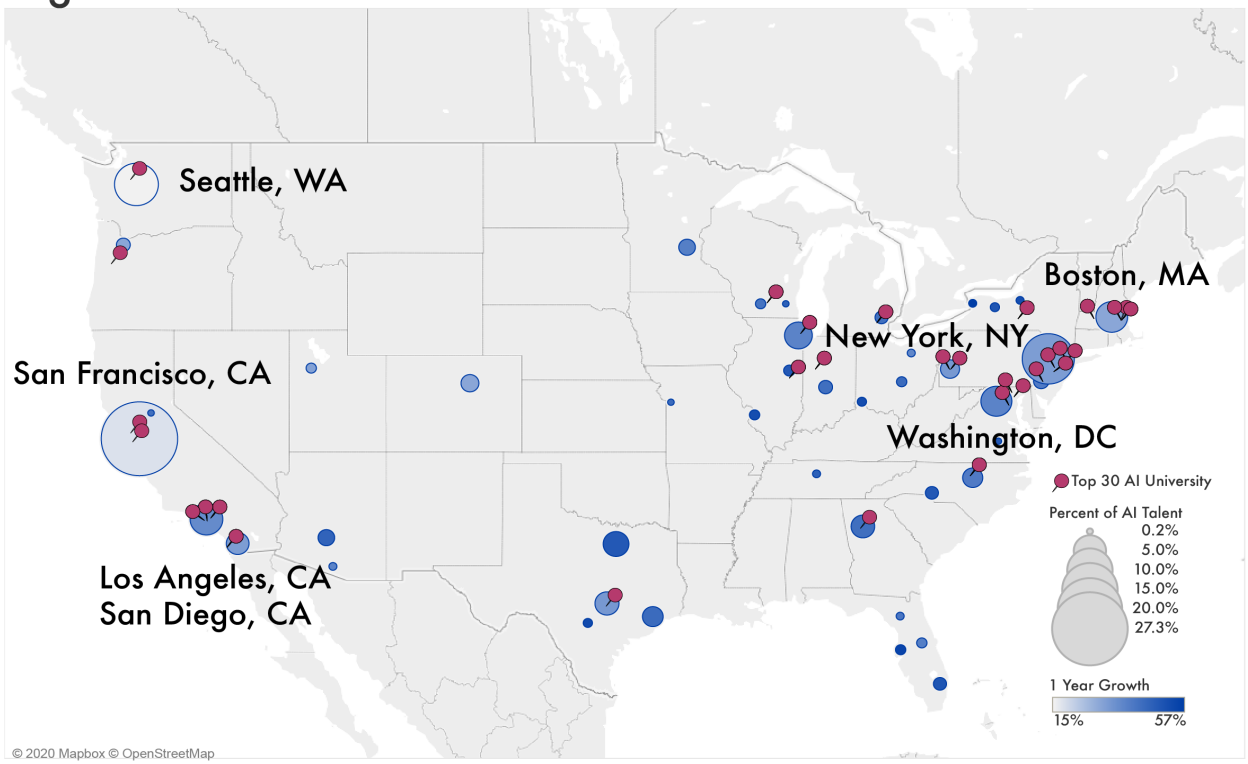

Figure 1. Map shows what proportion of the total amount of workers with AI skills reside in each Bureau of Economic Analysis Economic Area, as well as the growth rate of these workers. A larger circle indicates a higher percentage of AI talent, while a darker blue shade indicates a higher growth rate of such workers for each area. A pin represents the location of a top 30 AI university program.

Figure 1 maps AI talent across the United States: the red pins indicate the top AI university programs, the circle sizes show the fraction of AI talent in an area, and the colors of each circle the rate at which talent is increasing in an area. There are more top AI universities in the eastern half of the country (53 percent) than the western (27 percent). In contrast, AI employment is more diffuse, with 41 percent of the employment on the West Coast and 23 along the East Coast, with multiple hubs on both. Looking more closely, the key centers employing AI professionals are San Francisco (27 percent), New York (13 percent), Seattle (nine percent), and Los Angeles, Boston, and Washington-Baltimore (roughly five percent each). While San Francisco hosts the largest fraction of the AI workforce, the region has the lowest AI employee growth rate at 18 percent, while East Coast hubs grow at between 30 and 57 percent. Additionally, the West Coast attracts a significant portion of its talent from universities based in the eastern United States. San Francisco, for example, attracts 26 percent of its talent from them, while Seattle, Los Angeles, and San Diego each attract about 20 percent of their talent from the east. In contrast, New York, Boston and the Washington-Baltimore region attract only about five percent of their talent from the West Coast.

Figure 2. Total and Chinese Investment by Economic Region

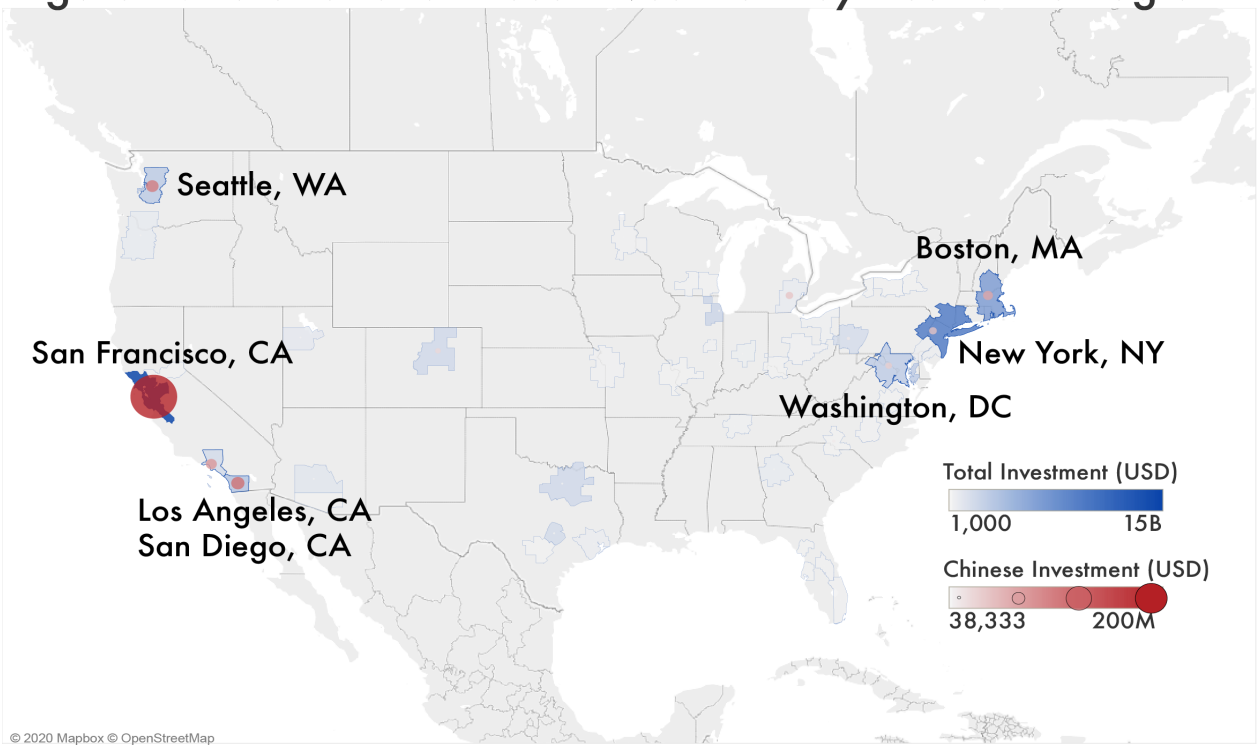

Figure 2. Map of investment in AI companies to BEA Economic Areas. The darker blue shading for a BEA Economic Area represents more money being invested in that area, regardless of the source. The darker and larger the red circle, the more Chinese investment into AI companies in that area. *Note: The Chinese investment color and size scale is capped at $200 million, but San Francisco brings in $1.425 billion. The scale includes this break to make the distinctions between all other visible areas.

As the national security community becomes increasingly concerned about Chinese involvement in the U.S. tech sector, foreign investments in the U.S. industrial base have attracted growing scrutiny.[1] The dialogue generally assumes that China grows its indigenous tech companies by acquiring smaller U.S. start-ups or investing in start-ups to gain access to new technologies.[2] Figure 2 maps total financial investment in AI industries (in blue) and corresponding Chinese-sourced investments (in red).

We see AI hubs emerge across the United States: San Francisco, New York, Boston, San Diego, Seattle, and Washington-Baltimore—together accounting for over 80 percent of the U.S. AI equity investment.[3] San Francisco nets a majority of AI industry funding within the United States, with 52 percent of a total $80.4 billion; New York follows with $9.1 billion, or approximately 11 percent.

To assess how deeply Chinese investment has penetrated the emerging American AI industrial sector, we compiled all venture capital rounds with disclosed Chinese investors and AI company targets in the Crunchbase database. We then estimated the Chinese investors' total contribution within these rounds, assuming equal contributions of all investors in the investment round in which they participated (understanding this method builds in uncertainty). We estimate that Chinese-based funders made disclosed investments of roughly $1.9 billion in U.S. AI companies from 2000 to 2020—2.4 percent of total disclosed investment during that period. Almost three-quarters of this estimated investment flows into the San Francisco region ($1.4 billion), challenging the notion that China is capturing American start-ups across the nation and offering an opportunity to shore up innovation centers outside of Silicon Valley.[4]

Takeaways

In the minds of Americans and people around the globe, the San Francisco Bay Area has long led in tech-based innovation. However, the present moment may offer opportunities for American innovation in AI to grow and thrive across the country. With half of the AI investment—but roughly a quarter of current or future AI talent—San Francisco and the Silicon Valley region have a unique kind of talent shortage: they must create more attractive work conditions to recruit talent from further afield. East Coast hubs are growing the AI industrial talent base at a much higher rate, ranging between 30 and 57 percent. Hubs outside of Silicon Valley may have a home-field advantage, offering more direct local access to talent and, excluding New

York City, lower costs of living. With high levels of resident talent and lower levels of penetration by Chinese investment, the Midwest and East Coast regions offer compelling investment and procurement opportunities for those that value both AI and security.

Our analysis indicates that China's disclosed investment in U.S.-based AI companies is probably less pervasive than originally hypothesized. We estimate that China comprises a relatively small portion of total investment in U.S. AI companies. Additionally, Chinese investment concentrates on the West Coast, with 85 percent going to San Francisco, Seattle, and San Diego. This clustering may provide real opportunities for security-minded investors and purchasers to seek hubs in other geographic regions.

Acknowledgments

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Appendix: Methodology

- **Identifying Top AI Universities:** We compiled a list of the top 30 AI and Computer Science programs in the nation using US News and World Report's top 20 AI programs list supplemented with CSRankings' top AI computer science programs list.
- **Identifying AI Companies:** AI companies were identified through a query on all companies in Crunchbase and Refinitiv's databases and compiled into one list. The query utilized a keyword search within each company's description.[5]
- **Identifying Geographic Hubs:** All analysis and data apply at the Bureau of Economic Analysis (BEA) Economic Area level. The following are major hubs that we identify: Boston-Worcester-Manchester, MA-NH Area (Boston); Los Angeles-Long Beach-Riverside, CA Area (Los Angeles); New York-Newark-Bridgeport, NY-NJ-CT-PA Area (New York); San Diego-Carlsbad-San Marcos, CA (San Diego); San Jose-San Francisco-Oakland, CA Area (San Francisco); Seattle-Tacoma-Olympia, WA Area (Seattle); Washington-Baltimore-Northern Virginia, DC-MD-VA-WV Area (Washington-Baltimore). Talent data was acquired through a LinkedIn

Talent Insights Talent Pool Report on March 23, 2020. The data represents the top 100 cities (then aggregated into BEA Economic Area in terms of professionals with at least one of these AI-related skills: Artificial Intelligence; Machine Learning; Computer Vision; Deep Learning; Artificial Neural Networks; Neural Networks; and Natural Language Processing.)

- **Identifying AI Investments:** Data extracted from Crunchbase's bulk data service on March 2, 2020, viewing only U.S.- and Chinese-based investors funding U.S.-based AI companies through funding rounds and company acquisitions. We matched AI companies to investments in Crunchbase through the companies' Crunchbase URLs.
- These investment amounts reflect the amount raised in funding rounds for companies invested in through venture capital and the price of acquisition for companies purchased through a merger or acquisition. Exact amounts are not provided per investor, so they were estimated by dividing the total raised in a funding round by the number of investors.

Endnotes

[1] Rolfe Winkler, "China Investment in U.S. Startups Keeps Flowing Despite New Rules," *The Wall Street Journal*, March 15, 2019; Karen Freifeld and Alexandra Alper, "U.S. officials agree on new ways to control high tech exports to China," *Reuters*, April 1, 2020.

[2] Rebecca Fannin, "China's tech giants are pouring billions into US start-ups," *CNBC*, March 9, 2017; Cory Bennett and Bryan Bender, "How China acquires 'the crown jewels' of US technology," *Politico*, May 22, 2018.

[3] Crunchbase database, accessed February 28, 2020.

[4] A similar approach was used in Rhodium's "Disruption: US-China Venture Capital in a New Era of Strategic Competition" study, published January 2020.

[5] The family of "machine intelligence" or "artificial intelligence" terms were required, plus another match from the following list of term families: "analytics," "predict," "robot," "cluster," "adapt," "diagnose," "automate," "detect," "personalize," "label," "augment," "sense," "recommend," "optimize," "chatbot," "bbot," "digital assistant," "virtual assistant," "semiconductor," "chipset," "GPU," "ASIC," "FPGA," "(high) performance computing," or "knowledge graph." The description could also require "transfer learning," "reinforcement learning," "one shot learning," "zero shot learning," "supervised learning," "unsupervised learning," or "machine learning," along with another match from the following set of term families: "self driving," "driverless," "autonomous," "deep learning," "cognitive computing," "synthetic data," "neural net," "predictive analytics," "computer vision," "machine vision," "generative adversarial network," "RNN," "DNN," "RGAN," "DGAN," "natural language processing, "natural language understanding," "speech processing," "speech understanding," "NLP," "feature extraction," "feature learning," "feature matching," "feature selection," "autoencode," "tensorflow," "keras," "theano," "q learning," "q value," "q network," "hyperparameter," "support vector machine," "Boltzmann machine," "machine translation," "machine perception," "facial recognition," "facial classification," "speech recognition," "speech classification," "voice recognition," "voice classification," "music recognition," "music classification," "image recognition," "image classification," "character recognition," "character classification," "text recognition," "text classification," "emotion recognition," "emotion classification," "video recognition," "video classification," "gesture recognition," or "gesture classification."