

# The Current State of Venture Capital Investment in Artificial Intelligence and Machine Learning in Orthopaedic Surgery

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**INTRODUCTION:** Global interest in artificial intelligence (AI) and machine learning (ML) has grown exponentially in recent years. Consequently, there is growing demand for implementation of these technologies in healthcare, including orthopaedic surgery. This study evaluated the current state of venture capital (VC) investment in AI and ML technologies in orthopaedic surgery.

**METHODS:** All VC-backed investments pertinent to AI and ML in orthopaedic surgery between 1/1/2019 and 12/31/2023 were retrospectively reviewed using PitchBook financial database software (PitchBook Data Inc., Seattle, Washington). Deals with undisclosed funding amounts were excluded. Investment deals were reviewed for timing of deal, size of investment (United States Dollars, USD), and VC investor name and location. Each company was reviewed for location, type, and exit status (defined as acquisition, initial public offering, or secondary sale). Deals were further categorized with respect to funding category: Biotechnology, Decision/Risk Analysis, Drug Discovery, Hospital Management, and Surgical Devices. The top five most active VC investors were identified. Descriptive statistics and regression analysis (Poisson or Negative Binomial) were performed using STATA V18.

**RESULTS:** Over the study period, a total of 44 VC investment deals were made specifically in AI or ML technologies for orthopaedic surgery. This amounted to \$594.98 million (USD) in total capital invested. Both the number of deals and capital invested peaked in 2022 (11 deals, \$306.2 million), with the latter being significantly higher than all other years ( $p < 0.0001$ ). The category with the highest amount of capital invested was Drug Discovery, with three deals comprising over 43% of all capital invested (\$257.5 million,  $p < 0.0001$ ). The top 5 most active investors were based in the United States, New Zealand, Hungary, China, and United Kingdom. Companies headquartered in the United States received the most investment deals and capital invested (21 deals, \$432.66 million,  $p < 0.0001$ ). Within the United States, California had the highest volume of investment deals and capital invested (8 deals, \$302.98 million), followed by Massachusetts. No VC-backed companies have exited at the time of this study, with many currently still in early or mid-stage fundraising rounds.

**DISCUSSION AND CONCLUSION:** There is significant, rising global interest in surgical applications of AI and ML, led by companies in the United States. The current landscape of VC-backed investments in orthopaedic surgery demonstrates strong potential for growth, although whether these technologies transition to effective clinical applications remains to be seen.

Figure 1: Venture capital investments in AI or ML in orthopaedic surgery over the past five years by (a) number of investment deals and (b) capital invested (millions, USD).

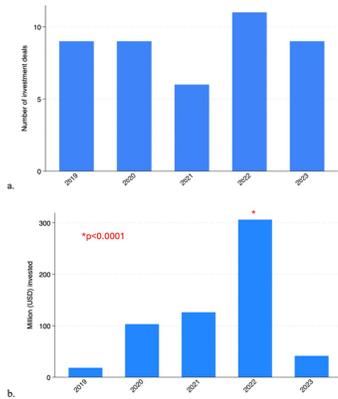


Figure 2: Venture capital investments in AI or ML in orthopaedic surgery by country with respect to (a) number of investment deals and (b) capital invested (millions, USD).

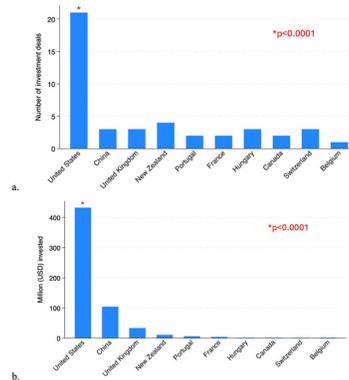


Figure 3: Venture capital investments in AI or ML in orthopaedic surgery by category with respect to (a) number of investment deals and (b) capital invested (millions, USD).

