Startups and Artificial Intelligence

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**ABSTRACT**

The general objective of the research was to determine the advances related to the startups and artificial intelligence. The specific objectives of the research are to identify the most successful startups that use artificial intelligence and the countries that invest the most in startups. Methodology, in this research, 53 documents have been selected, carried out in the period 2018 - 2024; including: scientific articles, review articles and information from websites of recognized organizations. Results, the number of startups is increasing rapidly on various continents and is applied in various economic sectors. Artificial Intelligence is having a significant impact on various human activities around the world. The current concern is the ethical use of AI, which is why various governments and international organizations are establishing recommendations and limitations for corporations that carry out such research. The startups that are currently emerging have artificial intelligence as their main component, due to the great advantages it offers. The United States, China and the United Kingdom are leading investment in startups worldwide. Conclusions, about the general objective of the research, to determine the advances related to the startups and artificial intelligence. The number of startups is increasing rapidly on various continents and is applied in various economic sectors. The current concern is the ethical use of AI. The startups that are currently emerging have artificial intelligence as their main component, due to the great advantages it offers. About the first specific objectives of the research, to identify the most successful startups that use artificial intelligence. On all five continents, there are several startups that use artificial intelligence and seek to provide technological solutions in the various fields of human activity. About the second specific objectives of the research, the countries that invest the most in startups. The United States, China and the United Kingdom are leading investment in startups worldwide.

**Keywords**: startups, artificial Intelligence, innovation.

**1 INTRODUCTION**

The general objective of the research was to determine the advances related to the startups and artificial intelligence. The specific objectives of the research are to identify the most successful startups that use artificial intelligence and the countries that invest the most in startups.
The importance of technologies created by startups in terms of positive environmental impact has been reflected in scientific works worldwide. They have a powerful impact on the building and dynamic development of green economies manifested in various aspects of society (Olek, 2023).

Startups constitute an important aspect of a nation’s economic growth. They contribute to job creation and economic development at both regional and national levels. Several breakthrough innovations and the largest businesses have been generated by startups; thus, their potential is real (Tripathi, Seppänen, Boominathan, Oivo & Liukkunen, 2019).

The results confirm the dominant influence of human and financial capital on the establishment of start-ups…The results also point to the positive role of direct city involvement in the development of this form of entrepreneurship (Jonek-Kowalska & Wolniak, 2021).

Given the widely acknowledged importance of new venture creation to innovation, employment and economic growth, in recent years a variety of policy initiatives aiming at promoting the establishment, growth and impact of innovative start-ups have been issued worldwide (Audretsch, Colombelli, Grilli, Minola & Rasmussen, 2020).

The event will exhibit 2,600 start-ups, which is a record for Web Summit’s flagship event in Lisbon. Almost one-third of those start-ups are founded by women from more than 85 countries, including Trinidad and Tobago, Lichtenstein, Peru, and Ghana. There will be more than 900 investors present for start-ups to showcase their companies, as well as multiple pitching competitions (Davies, 2023).

Artificial intelligence (AI) is ripe to help resolve certain major problems in Africa, from farming to the health sector, but Senegalese expert Seydina Moussa Ndiaye is warning of a new “colonization” of the continent by this new technology if foreign companies continue to feed on African data without involving local actors (UN News, 2024).

Startups play an important role in the development of today's society. With the impulse of artificial intelligence the impact is much greater.

2 METHODOLOGY

The research presents a qualitative-interpretative design, of a documentary type, which specified the selection procedure and the data recording (Barrero & Rosero, 2018).

In this research, 53 documents have been selected, carried out in the period 2018 - 2024; including: scientific articles, review articles and information from websites of recognized organizations. The keywords used in the searches were: Startups, artificial intelligence, innovation. For the selection of the documents, the following criteria were used: the year of publication, belonging to the research and being a reliable source. After reading each document, the data was entered into the bibliographic matrix, which is used to catalog the documents according to categories, which are presented in Table 1.
3 RESULTS

3.1 STARTUPS

Startup is a new company with a high growth potential owing to its scalable business model and use of new technologies. Startups have gone from strength to strength in recent years. According to Statista, the number of fintechs (finance startups) in the Americas had risen from some 5,700 in 2018 to over 10,700 by the end of 2021. Europe, the Middle East and Africa alone are home to more than 9,300 fintechs (Santander, 2023).

Startups are businesses that want to disrupt industries and change the world—and do it all at scale. Startup founders dream of giving society something it needs but hasn’t created yet—generating eye-popping valuations that lead to an initial public offering (IPO) and an astronomical return on investment (Baldridge, 2022).

Startups are not only transforming markets and economic growth; some are helping save the planet. Venture capital investment in startups has surged to its highest level ever – $148 billion last year alone. More than 40 Venture Capital-backed companies achieved billion-dollar valuations and joined the unicorn club (UN-SPBF, 2024).

We probe the connections between design and performance in ways that integrate previously disparate research on accelerators and expand our understanding of startup intermediaries. Our findings delineate the building blocks as well as an agenda for future researchers to build upon not only our understanding of accelerators, but also our understanding of what new ventures need to survive and flourish (Cohen, Fehder, Hochberg & Murray, 2019).

The term “startup” typically refers to a small, early stage company designed to grow fast. When we say fast, we mean 50-100x growth in a year, like what OpenSea or Whatnot saw in 2021. For most people, working in a hypergrowth environment can be exhilarating, dizzying and challenging—all at once (Y Combinator, 2023).

What is a startup anyway? If you look up the definition of a startup, it can range from the simple “fledgling business enterprise” or to the more comprehensive “company or project undertaken by an entrepreneur to seek, develop, and validate a scalable economic model”. In the broadest sense, any new company is a startup. But until when can you carry the ‘startup’ label? Beyond the aesthetics and what people refer to as the ‘startup’ mindset, when are you no longer a startup? (Sanchez, 2021).
The leading ecosystems actors appoint the new firms as startups, and usually academics, and young entrepreneurs design and establish these recent ventures. Many studies state that startups impact positively in the economy, contribute to its development, explore new market possibilities by investigating concrete exponential problems (Reisdorfer-Leite, Marcos de Oliveira, Rudek, Szejka, Canciglieri (2020)).

Finally, interactions with market-oriented actors are predominant in the market phase, and startups still bundle innovation and social resources, yet of a different nature. Our findings shed light on how startups’ changing needs throughout their lifecycle affect the interactions in startups’ innovation ecosystem (Marcon & Duarte, 2021).

The number of startups is increasing rapidly on various continents and is applied in various economic sectors.

3.2 ARTIFICIAL INTELLIGENCE

Recently AI has become a topic of interest for many researchers and practitioners in the Business field due to its diverse applications in several industrial domains (Correia, Guerreiro & Tussyadiah, 2021).

Thus, business companies, academic research practitioners, and state policy should focus on the further development of the use of AI in SBMs (Di Vaio, Palladino, Hassan, & Escobar, 2020).
Our main contribution establishes the need for AI business-model innovation to be aligned with ecosystem innovation. Specifically, in short-term incumbents may use ecosystem reconfiguration strategy, whereas long-term strategies relate to ecosystem revitalization, and resilience (Burström, Parida, Lahti & Wincent, 2021).

Recent advancements in robotics, artificial intelligence, machine learning, and sensors now enable machines to automate activities that once seemed safe from disruption—including tasks that rely on higher-level thinking, learning, tacit judgment, emotion sensing, and even disease detection (Wright & Schultz, 2018).

Artificial intelligence (AI) is being increasingly integrated into scientific discovery to augment and accelerate research, helping scientists to generate hypotheses, design experiments, collect and interpret large datasets, and gain insights that might not have been possible using traditional scientific methods alone (Wang, Fu, Du et al., 2023).

Artificial intelligence (AI) is evolving—literally. Researchers have created software that borrows concepts from Darwinian evolution, including "survival of the fittest," to build AI programs that improve generation after generation without human input. The program replicated decades of AI research in a matter of days, and its designers think that one day, it could discover new approaches to AI (Gent, 2020).

Finally, we provide six directions on the future of AI regarding its requirements and expectations, looking at enforcement, employment, ethics, education, entente, and evolution (Kaplan & Haenlein, 2020).

Figure 2. Timeline of the development and use of artificial intelligence in medicine. AI, Artificial intelligence; DL, deep learning; FDA, U.S. Food and Drug Administration; CAD, computer-aided diagnosis

Source: Kaul, Enslin & Gross (2020)
Artificial intelligence (AI) can be defined as a set of computerized systems that perform tasks usually associated with human beings. It reaches or exceeds human intelligence as it achieves human-like levels of perception, reasoning, interacting, and learning. Like human beings, artificial intelligence systems in intelligent machines can instigate changes in their own behavior without explicit reprogramming (Farzaneh, Malehimirchengini, Bejan, Afolabi, Mulumba, Daka, 2021).

Artificial intelligence is an interdisciplinary subject that involves information, logic, cognition, thinking, systems, and biology. It has been used for knowledge processing, pattern recognition, machine learning, and natural language processing (Zhang & Lu, 2021).

Figure 3. The general framework of AI

Source: Xu et al. (2021)

Artificial intelligence (AI) coupled with promising machine learning (ML) techniques well known from computer science is broadly affecting many aspects of various fields including science and technology, industry, and even our day-to-day life (Xu, Liu, Cao, Cai, Wang & Zhang, 2021).

Large language models (LLMs) are artificial neural networks trained on huge collections of text. When prompted with a statement or a question, the systems can generate a response by statistically predicting how to follow one sentence with the next (Castelvecchi, 2024).

The Recommendation on the Ethics of Artificial Intelligence was adopted by acclamation by 193 Member States at UNESCO’s General Conference in November 2021. This comprehensive instrument was two years in the making and the product of the broadest global consultation process of expert, developers, and other stakeholders from all around the world (Unesco, 2024).
According to Mishustin, Russia is one of the three world leaders in the development of digital technologies and is actively developing its artificial intelligence models. The economic effect of the introduction of AI technologies in Russia has already reached some 1 trillion rubles ($11 billion), and by 2030 it will exceed 10 trillion rubles ($110 billion), Mishustin said. "This indicator will add almost 6% to GDP to the Russian economy," he noted (Teslova, 2024).

Artificial Intelligence is having a significant impact on various human activities around the world. The current concern is the ethical use of AI, which is why various governments and international organizations are establishing recommendations and limitations for corporations that carry out such research.
3.3 STARTUPS AND ARTIFICIAL INTELLIGENCE

Startups embracing artificial intelligence (AI) as a component of their business models are quickly emerging right now. The application of AI technology in business has been going on for a while, even though recent research reveals that new or alternative business models are being implemented (Widayanti & Meria, 2023).

Our descriptive findings add to conversations on whether AI products enhance or replace human capabilities; which algorithms, data protections, and frameworks high-tech startups use to develop their AI products; and which geographies, customer-types, and industries are sales targets (Bessen, Impink, Reichensperger & Seamans, 2023).

The objective of our solution is to accurately predict the success of early stage startups and thus make accurate predictions under extreme uncertainty (Dellermann, et al., 2021).
This solution is very important, because it seeks to determine what the next unicorn startup will be.

Funding in artificial intelligence (AI) startups maintained a stable growth in the years before the coronavirus (COVID-19) pandemic, increasing from 18 billion U.S. dollars in 2017 to 26 billion U.S. dollars in 2020... Consequently, investments grew from a little over 30 billion U.S. dollars in 2020 to more than 65 billion U.S. dollars in 2021. However, investments in AI startups had been slightly declining in 2022 until the record level of funding for OpenAI and other generative AI investments at the tail end of the year (Thormundsson, 2023).

Finally, AI is more than Silicon Valley. It’s about the Silicon Savannah in Kenya, where AI startups are approaching $100m in funding. It’s about an emerging regional approach from Latin America, to Thailand’s efforts to shape an AI ecosystem by 2027, and everywhere in between. Many of the exciting, important, and cutting-edge explorations of AI are being undertaken in ‘developing’ countries (United Nations Development Programme, 2023).

Eleven of the country's top 20 AI companies are in San Francisco and have raised $15.7 billion collectively between 2008 and 2023. However, they employ a total of only 3,400 people in the city, according to an analysis from San Francisco Mayor London Breed's office which used data from venture capital firm NFX (Tong, 2023).

Today, the Commission has launched a package of measures to support European startups and SMEs in the development of trustworthy Artificial Intelligence (AI) that respects EU values and rules. This follows the political agreement reached in December 2023 on the EU AI Act – the world's first comprehensive law on Artificial Intelligence – which will support the development, deployment and take-up of trustworthy AI in the EU (European Commission, 2024).

With the objective to foster and accelerate AI in Europe, the appliedAI Institute for Europe (Germany), Hub France IA, Ignite Sweden, AI Sweden, RISE Research Institutes of Sweden (Sweden) and the Netherlands AI Coalition (NL AIC) came together in early 2020 to start the initial steps in mapping the AI startup ecosystem in Europe (AppliedAI Institute for Europe gGmbH, 2023).

For entrepreneurs, this represents a major opportunity. The global GenAI market is forecast to reach $42.6 billion this year, according to PitchBook, and while VC investing overall remains in a slump, corporate VC funding for AI startups in Q1 2023 increased about 37% from 2022 (Carbonara, 2023).

The startups that are currently emerging have artificial intelligence as their main component, due to the great advantages it offers.

3.4 THE MOST SUCCESSFUL STARTUPS THAT USE ARTIFICIAL INTELLIGENCE

We will explore the realm of AI and introduce 20 highly promising startups from Europe that are harnessing its power. These startups represent a diverse range of industries and applications, leveraging
AI to solve complex challenges and shape the future. From healthcare to finance, logistics to sustainability, these companies are driving transformative changes and propelling Europe to the forefront of AI innovation. Highly promising startups from Europe are: Greyparrot, Yokoy, Scissero, TWAICE, DRUID Ai, Akur8, OroraTech, Libeo, Erudit, LabTwin, Posos, TechWolf, Vara, Lang.ai, Outsight, Aifora, Alex Therapeutics, ASSAIA, Aive, Jua (Escárzaga, 2023).

The 34 most promising AI startups of 2023, according to top VCs:

- Adept: a machine learning research lab.
- Aily Labs: customized AI tools for companies.
- Captions: an intelligent video editor.
- CentML: optimizes machine learning models.
- Character.AI: AI-powered chat.
- Durable: AI for business services.
- Entos: using AI to design and discover drugs.
- Foundry: a computing and infrastructure platform for AI workloads.
- GPTZero: detects AI-generated text.
- Hugging Face: an open-source and community-driven AI platform.
- LangChain: a framework for building applications using LLMs.
- Leena AI: an AI-powered virtual work assistant.
- LlamaIndex: LLM-powered search for large databases.
- Luma AI: an app to create 3D imagery.
- Lumachain: a real-time platform for food supply chains.
- Magic.dev: an AI teammate for software engineering.
- Mezli: a fully autonomous restaurant that serves Mediterranean-inspired grain bowls.
- Mindee: document processing automation.
- MindsDB: an AI logic tool for software developers.
- Next Insurance: insurance for small businesses.
- Noetica AI: uses AI to extract knowledge from complex financial documents.
- Orby AI: AI for repetitive work tasks.
- Pinecone: an AI vector database.
- Poly: a generative-AI startup for design assets and creative textures.
- Predibase: for quickly building and deploying custom machine-learning models.
- Replicant: AI customer service.
• Replicate: machine-learning models on the cloud.
• Run:ai: software to boost GPU performance.
• SaaS Labs: an automation platform for sales and support agents.
• Secureframe: automated security and compliance services.
• Treat: generative AI for product photos.
• Twelve Labs: helps developers build video applications.
• WellSaid: AI for corporate presentations and ad campaigns (Bort et al., 2023).

Latin America has never been short of innovation—whether from ambitious newcomers or established companies with fresh initiatives. The 10 most innovative companies in Latin America in 2023 are: Nubank, 3dar, Copec S.A., Nuvocargo, Symplifica, Platzi, Jüsto, Mamotest, Medu, Gran Cursos Online (Hernández, 2023).

The APAC region is fast becoming both a center for advanced computing and AI. Companies coming out of Japan, India, Singapore South Korea, Taiwan, and others have created a regional innovation hub propelling AI forward to unimaginable heights. A few startups from the APAC region that you’ll want to keep an eye on: Kellton, E42, NeenOpal, Simpragma, Lil Projects, I’mCloud, Avaxia, Fracta Leap, FS Solution, AI Technology (ODSC Team, 2023).

At Indonesia the most dominant startup company that implemented artificial intelligence is Bukalapak with score 87,771 (Maulina, Purnomo, Wicaksono & Rizal, 2020).


![Leading artificial intelligence (AI) providers in Russia in 2022, by revenue (in million Russian rubles)](image)

Source: Statista (2024)
The figure 8 show leading artificial intelligence providers in Russia in 2022: Cloud.ru, STC Group (SpeechPro), Maxima and VS Robotics.

Australia is quickly making a name for itself in tech innovation, especially in Artificial Intelligence (AI). This growing sector is driven by a bunch of dedicated companies, all working towards a smarter, more efficient future:

- **Artificial Workflow**: Based in Brisbane, Artificial Workflow is known for its Gen AI consulting and solutions designed to boost business processes.
- **September AI Labs**: Specializing in advanced AI prototyping and product development, September AI Labs caters to clients looking to explore AI opportunities and seamlessly integrate AI solutions into their business operations.
- **Outsource Bigdata**: Primarily an AI-driven Web Scraping, Data Labeling, and Automation Solution provider, Outsource Bigdata helps in converting web data into ready-to-use formats, enhancing data-driven decision-making.
- **Magicmind Technologies Limited**: While having a broader digital solutions scope, Magicmind Technologies seems to have a global aspiration to bridge technological gaps, with a potential interest in AI.
- **Fingent**: Fingent is vested in developing Intelligent Applications harnessing AI and Machine Learning to drive innovation and solve complex business challenges.
- **Codewave Technologies**: Codewave emphasizes an innovation-first, design thinking-led digital transformation approach, potentially integrating AI to foster growth and solve complex issues (Medium, 2023).

Connecting Africa has compiled a list of five AI powered startups that have been making an impact in the lives of the communities they serve and are worth watching in 2023:

- **iiDENTIFii**: South African-based digital identity startup iiDENTIFii has created a face authentication technology that safely authenticates users via their cell phones or computers within seconds.
- **Amini**: Nairobi-based climate tech startup Amini is focused on solving Africa's environmental data gap through artificial intelligence and satellite technology and has raised $2 million in a pre-seed funding round.
- **Curacel**: Nigerian-based Curacel is an AI platform that aims to drive insurance penetration in emerging markets via APIs enabling insurers to connect with digital distribution channels and administer their claims.
• AIfluence: Founded by Nelson Aseka, Lamusia Anzaya and Ankit Jindal in 2019, AIfluence uses advanced machine learning algorithms to match influencers with a target demographic through its audience-first strategy.

• GotBot: South Africa's GotBot is an AI chatbot solution that automates and improves business responses to business audiences (Sehloho, 2023).

On all five continents, there are several startups that use artificial intelligence and seek to provide technological solutions in the various fields of human activity.

3.5 THE COUNTRIES THAT INVEST THE MOST IN STARTUPS

We develop and analyze a novel dataset of 657 U.S. cleantech startups and 2,015 alliances with governments, firms, research organizations, and not-for-profit organizations from 2008 to 2012 and analyze short-term firm outcomes from the different alliances. Our findings highlight the importance of governmental partners in technology development alliances to catalyze cleantech startup innovation (the patenting activity of cleantech startups increases by 73.7 percent with every additional governmental technology alliance when compared to those startups that did not engage in such alliances) … (Doblinger, Surana & Diaz, 2019).
Figure 9. The AI Race

Source: Global X ETFs

The United States, China and the United Kingdom are leading investment in startups worldwide.
4 DISCUSSION

The results of the investigation, the number of startups is increasing rapidly on various continents and is applied in various economic sectors. Artificial Intelligence is having a significant impact on various human activities around the world. The current concern is the ethical use of AI, which is why various governments and international organizations are establishing recommendations and limitations for corporations that carry out such research. The startups that are currently emerging have artificial intelligence as their main component, due to the great advantages it offers. The United States, China and the United Kingdom are leading investment in startups worldwide, they coincide with the following authors Ade-Ibijola, Okonkwo (2023) “we highlight the challenges facing the adoption of AI technologies in Africa which include skills acquisition, lack of structured data ecosystem, ethics, government policies, insufficient infrastructure and network connectivity, uncertainty, and user attitude”, Corrêa, Galvão, Santos, Del Pino, Pinto, Barbosa, Massmann, Mambrini, Galvão, Terem & de Oliveira (2023) “from these analyses, it was possible to diagnose at least 17 groups of principles listed among the 200 guidelines analyzed. This information certainly contributes as a guide for the discussions that are taking place on how to regulate artificial intelligence, indicating what objectives/minimum requirements should be protected by future legislation. Besides, by making our work and results open, other researchers can easily extend and replicate our work” and Kennedy (2023) “the United States and China remain at the forefront of AI investment, with the former leading overall since 2013 with nearly $250 billion invested in 4,643 companies cumulatively”.

5 CONCLUSIONS

About the general objective of the research, to determine the advances related to the startups and artificial intelligence. The number of startups is increasing rapidly on various continents and is applied in various economic sectors. The current concern is the ethical use of AI. The startups that are currently emerging have artificial intelligence as their main component, due to the great advantages it offers.

About the first specific objectives of the research, to identify the most successful startups that use artificial intelligence. On all five continents, there are several startups that use artificial intelligence and seek to provide technological solutions in the various fields of human activity.

About the second specific objectives of the research, the countries that invest the most in startups. The United States, China and the United Kingdom are leading investment in startups worldwide.
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