# Design and Development of a 3D Bioprinter Based on a Robotic Manipulator for Arbitrarily Shaped Scaffolds in Tissue Engineering Applications

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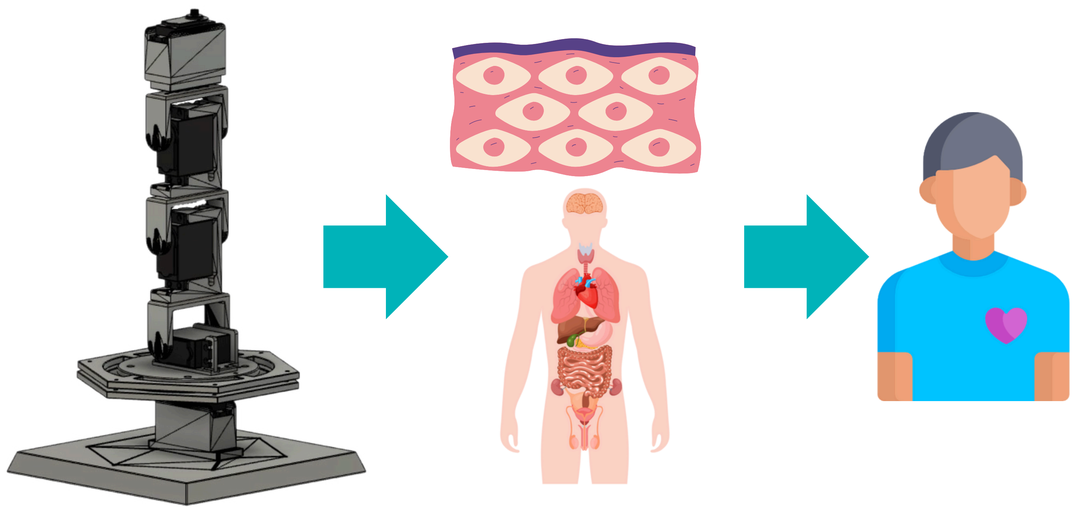
## INTRODUCTION

- **Tissue engineering** focuses on **creating customized tissues and organs** for patients.
- **3D bioprinters** are essential for **producing complex scaffolds** that **replicate** human **tissue**.

**Objective:** designing and developing a **3D bioprinter** using a **robotic manipulator** to create **arbitrarily shaped scaffolds** tailored for tissue engineering.



***Bioprinter:*** *A **3D printing device** that uses **biocompatible materials**, including cells, to create structures that **mimic natural tissues** for medical applications.*

## MATERIALS AND METHOD

- **5-DOF robotic arm** controlled by a **computer vision system**.
- Prints **scaffolds** with simulated **bioinks** similar to lab-grade.
- Robotic arm **enables complex, customized shapes**.
- System programmed in **MATLAB**.



## RESULTS & DISCUSSION

- The bioprinter effectively produces **complex tissue-mimicking scaffolds**.
- The **computer vision** system allows for precise and adaptable **in situ control**.
- Mechanical components are fully **functional**, ensuring reliable performance.
- The extrusion system **operates successfully**, supporting **efficient material deposition**.
- Casing development is almost complete, providing a **robust enclosure**.
- **Viability tests** are in the final stages, validating the system's potential for real-world applications.

## CONCLUSION

*The developed bioprinter has proven to be an **effective** tool for creating **personalized scaffolds**. Its ability to generate **complex structures** positions it as a **promising technology in tissue engineering**. **Future improvements** could include **enhancing precision controls** and **optimizing printing times**.*

## ACKNOWLEDGEMENTS

Special thanks to Dr. Isaac Chairez and Dr. Alejandra Hernandez for their guidance throughout this project, and to the Tecnológico Institute for the support provided.

## BIBLIOGRAPHY

Ayala Roldán, D. P., Chairez Oria, I., & Hernández, A. (2023). Advances in bioprinter technology: Revolutionizing tissue engineering (pending revision).