

# **Participatory Modeling for Societal Complexity in Healthcare**

## **Background and motivation**

**By Heider Jeffer**



# Hello and welcome!

We're excited to share our work on participatory modeling for societal complexity in healthcare.

**Explore and engage with our resources below:**

- **Discover Our Project:** Learn about our approach and research on [GitHub](#).
- **Try It Out:** Experiment with our simulation through this interactive [Google Colab notebook](#).
- **Explore the Code:** Dive into the details of our simulation by reviewing the [source code](#).
- **Here you can find:** [How we use Python to answer the Research Questions](#)
- **In the appendix you can find:** [Formula, Numerical Example, Simulation Steps that we used in Python to answer the research questions](#)
- **Here you can find** [Software Requirements](#)

We'd love for you to explore, experiment, and share your thoughts with us!

**Heider Jeffer**

# Presentation Structure

- **Part 1:** My Background and how it relates to this KTH's PhD position?
- **Part 2:** What motivates me to pursue this position specifically?
- **Part 3:** How would My technical skill contribute to the research goals of this project?
- **Part 4:** Project where I used participatory modeling or similar techniques “KTH PhD project, Developed using Python by Heider Jeffer to answer (Research Questions)”?
- **Part 5:** What do I hope to learn from working within the InSilicoHealth Doctoral Network and at KTH?
- **Part 6:** I have Questions
- **Part 7:** Appendix

# **Part 1: My Background and how it relates to this KTH's PhD position?**

1. Interdisciplinary academic background
2. Master's thesis

# 1. Interdisciplinary academic background

- Having completed degrees in Physics and Operations Research, followed by advanced studies in Computer Science and Artificial Intelligence.
- My experience at USI, ETH Zürich and the Free University of Bozen-Bolzano (UNIBZ) involved hands-on projects and laboratory focused on participatory Modulation Simulation Optimization, Human Machine Interaction, software reliability and testing, Stochastic process and system dynamics—areas I believe are highly relevant to this position.

## 2. Master's thesis

- I explored the failure factors of the “Elizabeth Anne Holmes the American biotechnology entrepreneur the founder of Theranos as an exemplar case study for my research, specifically addressing the regulatory and legal challenges that contributed to its downfall. Using gray literature”.
- I developed a model for both qualitative and quantitative data collection and analysis. This approach allowed me to identify key factors related to the healthcare sector's challenges. Through this work, I further developed my technical expertise in Python, data analysis, and complex model building—skills I am eager to apply in the PhD role at KTH.





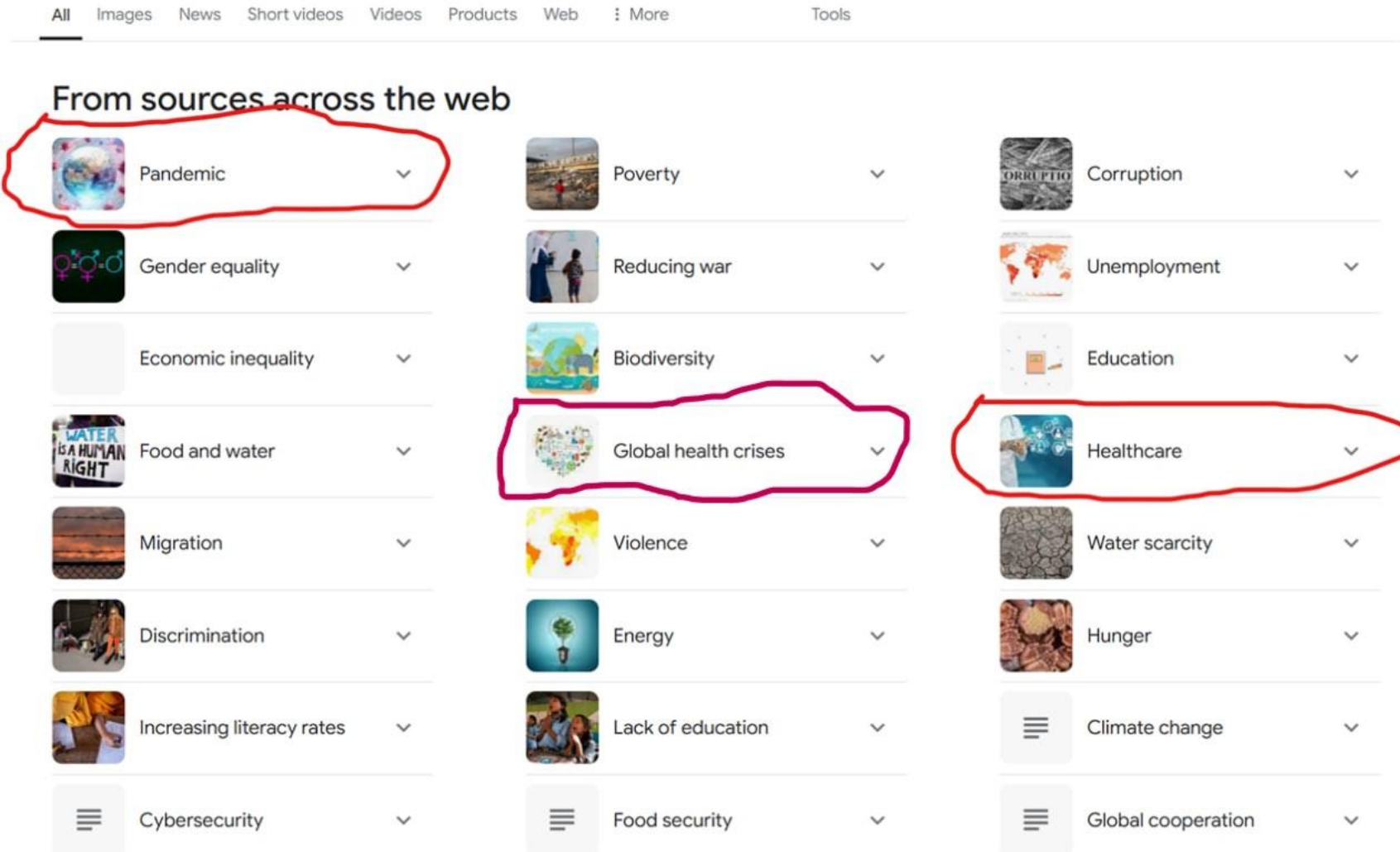




## **Part 2: What motivates me to pursue this position specifically?**

1. The escalating challenges in global healthcare
2. Driving Impact
3. Passion for Real-World Impact

# 1. The escalating challenges in global healthcare



# 1. The escalating challenges in global healthcare

- Global healthcare challenges—pandemics like COVID-19, antimicrobial resistance, unequal healthcare access, and rising health issues—are urgent and demand innovative solutions.
- The escalating challenges in global healthcare are hot topics that require immediate action, and we must start as soon as humanly possible.
- I am motivated to address these crises through KTH's platform, leveraging its leadership in research, technology, and collaboration to drive impactful solutions.
- KTH's expertise uniquely positions it to lead efforts in healthcare accessibility, health systems innovation, and health support in local, European and international level.
- Aligning my skills with KTH's mission, I aim to help tackle these pressing issues and build resilience against future global health challenges.

## 2. Driving Impact

- Advancing In Silico Models to Transform Decision-Making in Healthcare
- What excites me most about this position is the chance to work on the societal complexities surrounding silico models in healthcare.
- I see enormous potential in developing models that help stakeholders—such as healthcare providers and administrators—make informed decisions that benefit patients.

### **3. Passion for Real-World Impact**

- Leveraging Expertise in Design and Optimization to Contribute to KTH's Vision.
- My past projects on designing, modulation, simulation and optimization has fueled my interest in impactful, real-world applications, which aligns well with KTH's vision.
- I believe my motivation, combined with a practical approach, would enable me to contribute significantly to this PhD project and make a meaningful impact.

## **Part 3: How would My technical skill contribute to the research goals of this project?**

1. Technical skills
2. Experience

# 1. Technical skills

- My technical skills span a variety of areas relevant to this project.
- I am proficient in Python, Java, and other languages for modeling and simulation, which aligns well with the participatory modeling and complexity analyses required in this PhD project.



## 2. Experience

Experience with statistical methods and data visualization will support the rigorous analysis needed to validate and communicate findings effectively.

# Part 4: Project where I used participatory modeling or similar techniques

In this KTH PhD project. The Python code I developed for the KTH Project simulates stakeholder interactions and contributions within a participatory modeling framework, providing answers to the ([Research Questions](#)) explored in this project:

- **Primary Research Question:**

How can participatory modeling approaches be designed to simulate and address stakeholder interactions, agency complexities, and decision-making processes in the adoption of in silico models for healthcare systems?

- **Secondary Research Questions:**

How can simulation techniques be used to capture and analyze the interplay of diverse stakeholders in the healthcare ecosystem?

- *The code models the interactions and contributions of different stakeholders, providing a quantitative and qualitative analysis of their roles in decision-making processes.*

# **Part 5: What do I hope to learn from working within the InSilicoHealth Doctoral Network at KTH?**

1. Exploring KTH's Approach
2. Real-World Healthcare Insights
3. Gaining a Holistic Understanding of Healthcare Challenges

# 1. Exploring KTH's Approach

To learn about KTH's approach to integrating participatory modeling within healthcare systems and to understand the nuances of translating model outputs into practical strategies that can be implemented in hospitals

## **2. Real-World Healthcare Insights**

The secondments in Amsterdam and Karolinska University Hospital are also particularly exciting to me, as they offer a chance to experience firsthand how models are applied in real-world healthcare settings.

### **3. Gaining a Holistic Understanding of Healthcare Challenges**

Allowing me to develop solutions that support evidence-based policy and management decisions in healthcare

# Part 6: I have Questions

**Q1:** Could you share more about the specific goals the research group hopes to achieve with this project?

**Q2:** How does KTH facilitate collaboration between doctoral candidates within the InSilicoHealth network?

**Q3:** What qualities or skills have you found most beneficial for success in this doctoral program?

**Q4:** Could you explain more about the participatory model approaches used in this project?



**Thanks a lot**  
**The End**

# Part 7: Appendix