

Dipartimento di Informatica, Bioingegneria,  
Robotica ed Ingegneria dei Sistemi

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**Challenges in biomedical data science:  
data-driven solutions to clinical questions**

by

Samuele Fiorini

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**Dipartimento di Informatica, Bioingegneria,  
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**Ph.D. Thesis in Computer Science and Systems Engineering  
Computer Science Curriculum**

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data-driven solutions to clinical questions**

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Samuele Fiorini

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## **Abstract**

Abstract

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# **1 Introduction**

# **Part I**



## 2 Background

### 2.1 What is data science and why we should care

{

- Data engineering
- Data exploration
- Machine learning and data understanding
- Data visualization

}

### 2.2 Challenges in biomedical data science

### 2.3 From clinical questions to learning task

## **3 State of the art**

### **3.1 Basic notation and definitions**

### **3.2 Machine learning**

#### **3.2.1 Supervised learning**

##### **3.2.1.1 Regularization methods**

##### **3.2.1.2 Ensemble methods**

##### **3.2.1.3 Deep learning**

#### **3.2.2 Unsupervised learning**

##### **3.2.2.1 Manifold learning**

##### **3.2.2.2 Clustering**

#### **3.2.3 Model selection and evaluation**

##### **3.2.3.1 Model selection strategies**

##### **3.2.3.2 Feature selection stability**

##### **3.2.3.3 Performance metrics**

## **Part II**

## **4 ADENINE: a Data exploration tool**

## **5 Model for biological age prediction [temp. title]**

## **6 Temporal model for multiple sclerosis evolution**

## **7 Temporal model for glucose predictions**

## **8 Conclusion**



## **Bibliography**