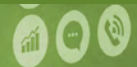




**UNIVERSITÀ  
DI TRENTO**

**DATA  
SCIENCE**

**MSc in  
Data Science**



# Layer

```
def training_data(self, training_data):
    for k in xrange(0, n, mini_batch_size):
        mini_batch = training_data[k:k+mini_batch_size]
        self.update_mini_batch(mini_batch, eta)
    if test_data:
        print "Epoch (%): (%1) / (%2)".format(
            j, self.evaluate(test_data), n_test)
    else:
        print "Epoch (%0) complete".format(j)
    te_mini_batch(self, mini_batch, eta):
        a_b = [np.zeros(b.shape) for b in self.biases]
        a_w = [np.zeros(w.shape) for w in self.weights]
        x, y in mini_batch:
            delta_nabla_b, delta_nabla_w = self.backprop(x, y)
            nabla_b = [nb+dnb for nb, dnb in zip(nabla_b, delta_nabla_b)]
            nabla_w = [nw+dnw for nw, dnw in zip(nabla_w, delta_nabla_w)]
            weights = [w-(eta/len(mini_batch))*nw
                       for w, nw in zip(self.weights, nabla_w)]
            biases = [b-(eta/len(mini_batch))*nb
                     for b, nb in zip(self.biases, nabla_b)]
        prop(self, x, y):
            a_b = [np.zeros(b.shape) for b in self.biases]
            a_w = [np.zeros(w.shape) for w in self.weights]
        edforward
        vation = x
        vations = [x] # list to store all the activations, layer by layer
        [ ] # list to store all the z vectors, layer by layer
        o, w in zip(self.biases, self.weights):
            z = np.dot(w, activation)+b
            z = sigmoid(z)
```





## Master of Science in Data Science

We consider Data Science as a **multidisciplinary science for the future**. Accordingly, this new MSc in Data Science aims at satisfying the increasing need for well trained and flexible **data analysis professionals**.

Our interdisciplinary approach allows students to become high-level Data Scientists: professional scientists with strong transversal skills, excellent data analysis competencies, and capable of working in dynamic and multidisciplinary environments.

Students are provided with deep theoretical, methodological and technical knowledge in **Computer Science and Mathematics and Statistics**, along with a specific domain of expertise in fields like **Social and Political Sciences, Industrial Engineering, Psychology and Cognitive Science, and Business**.

Traditional classes are complemented by **practical activities** like case studies analysis, working groups, internships, meetings and seminars with field experts, research institutions as well as public and private companies.

The MSc in Data Science is a joint collaboration between the Departments of Sociology and Social Research, Mathematics, Information Engineering and Computer Science, Industrial Engineering, Psychology and Cognitive Sciences, Economics and Management, The Center for Mind/Brain Sciences, and the Fondazione Bruno Kessler (FBK).

## Programme overview

### Degree awarded

Master of Science - "Laurea Magistrale" - in Data Science

### Language

English

### Class size

Up to 56 students

### Workload

The total workload for each student is 120 ECTS (European Credit Transfer System)

### Intake

September each year

### Duration

2 years full-time

### Fees and funding (approximate range)

- EU: 340€ - 3.400€ (based on income/merit)
- Non-EU: 1.000€ - 4.500€ (based on merit)
- Income/merit based scholarships and tuition waivers available



## Admission

### Application deadlines (check online for updates)

- February for all students (EU and non-EU citizens) world wide
- June only for EU citizens and non-EU citizens regularly living in Italy

### Selection criteria

- Assessment of previous studies and their coherence with the Master
- Academic curriculum
- Statement of purpose

### Requirements

- Bachelor's degree (or equivalent)
- Credits in following areas:
  - Computer Science/Information Engineering
  - Sociology/Economics/Psychology/Law
  - Mathematics/Statistics
- English at B2 level of the Common European Framework of Reference for Languages

### How to apply

- Access the online application form
- Upload the required documents
- Submit your online application by the deadline
- Check online for more information and updates:  
[www.unitn.it/datascience](http://www.unitn.it/datascience)

## Study Plan - First Year

The first year of the MSc in Data Science is organized into two curricula according to the student's academic background:

- **Curriculum A**, background in Computer Science, Mathematics, Physics, Statistics, Engineering;
- **Curriculum B**, background in Sociology, Economics, and Psychology.

### CURRICULUM A

#### Mandatory courses

- Data mining
- Foundations of social and psychological science:
  - ICT and social science theory and models
  - ICT cognitive psychology theory and models
- Information, knowledge and service management

#### In addition, one of the following courses:

Introduction to machine learning or Intelligent optimization for data science

### CURRICULUM B

#### Mandatory courses

- Mathematics for data science
- Scientific programming:
  - Programming
  - Algorithms and data structures
- Introduction to machine learning
- Computational social science

A close-up photograph of three young women with diverse backgrounds looking intently at a screen. The woman in the center has dark curly hair and is smiling slightly. The woman on the right has blonde hair and is also looking at the screen. The woman on the left has brown hair and wears glasses. They appear to be in a collaborative learning or work environment.

## COMMON COURSES

- Big data technologies
- Statistical learning:
  - Statistical methods
  - Statistical models
- Data visualization lab
- Professional English for data science
- ICT and law privacy and security
- Elective and open-choice courses
- Elective laboratories
- Internship
- Thesis



## Professional Profiles - Second Year

Study plans for specific Professional Profiles are offered during the Master's second years. Study plans can be personalized to accommodate the student's preferences.

### Social, economics, psychology oriented

Computational Social  
Scientist

Cognitive and  
Neuro-data Scientist

Business  
Analytics Scientist

### Mathematics, statistics, information engineering oriented

Data Analyst

Data Miner

Industrial Data  
Scientist



## Career opportunities

Data Scientists are professional figures that are increasingly requested in public administrations, companies in the private sector, industries, and a wide range of organizations worldwide.

There is an increasing demand for Data Scientists in:

- banking, manufacturing, telecommunications and media;
- public administration and health;
- large-scale distribution, utilities and insurance;
- public and private market research and analysis institutes;
- national and international organizations that develop and implement social and economical policies;
- innovative organizations devoted to the design of new services in the public sector;
- private companies, including SMEs, that use data and information to plan or restructure market strategies, process and product innovation and company management.







## CONTACT DETAILS

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