

## \*\* Internship positions at Bilbao \*\*

The Basque Center for Applied Mathematics (BCAM) is offering several internship positions to work on machine learning problems. This is an opportunity for MS and last year BS students to start a research career while learning very interesting topics.

You can find below the description of the positions. Further informations are available at the link <http://www.bcamath.org/en/research/internships> <<http://www.bcamath.org/en/research/internships>>.

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### Internship 1:

Research topic title: Minimaxsupervised classification

Research topic description: Supervised classification can be approached as a zero-sum game between learner and nature. Efficient algorithms can be enabled by using uncertainty sets of distributions defined by a generating

function. This project will develop techniques to determine such function and to estimate its expectations

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Keywords: supervised classification, statistics, probability

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Internship 2:

Research topic title: Open supervision for machine learning

Research topic description: Training data obtained in practice is often provided by a heterogeneous community that label examples with different levels of accuracy, ranging from perfect to missing annotations. This project will develop new machine learning techniques that utilize such weak and heterogeneous training data, and evaluate the performance gains with respect to existing approaches.

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Keywords: python/R/Matlab, supervised classification

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Internship 3:

Research topic title: Data science for energy management

Research topic description: Numerous data sets related with energy can be exploited in order to improve energy management both at large and small scales. For instance, weather data can serve to better schedule energy generation, historical consumption/generation data can serve to avoid outages, and contextual data can serve to use resources more efficiently. This project will develop techniques that utilize heterogeneous and possibly inaccurate, incomplete, or erroneous data in order to improve energy management

Keywords: Statistics, data science, machine learning

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Internship 4:

Research topic title: Probabilistic energy forecasting

Research topic description: Energy forecasting is widely used to manage energy resources, e.g., schedule generation and prevent outages. This project will

develop techniques that obtain probability distributions of future energy consumption/generation using energy related data. In particular, the techniques developed will use data such as historical consumption/generation, weather conditions, location, and time.

Keywords: Probabilistic forecasting, online learning, supervised learning

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Internship 5:

Research topic title: Projective geometry of convex sets and its application to machine learning

Research topic description: The natural transformations in machine learning (Markov transitions, stochastic kernels, channels, probabilistic mappings) are affine/projective transformations between probability simplexes. This project will 1) characterize such linear geometrical representation and its relationship with classical convex geometry, e.g., convex duality, support functions, and barycentric coordinates; and 2) develop machine learning techniques inspired by such geometrical interpretation, e.g., dimensionality reduction

based on invariance w.r.t. affine/projective transformations.

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Keywords: Projective geometry, convex geometry, advanced linear algebra.

Required knowledge and skills: Statistics/probability, Linear algebra, optimization, Programming in python or R or Matlab

Required language skills: Spanish or English

Duration and dates: 3 months; flexible dates depending student availability

Covered expenses: To be negotiated

Application deadline: 30th of August