IÑIGO MARTÍNEZ LÓPEZ

Visiting Student

Office: E15-394

E-Mail: [inigo@mit.edu](mailto:inigo@mit.edu)

<https://www.linkedin.com/in/inigomartinezl/en>

Iñigo is an engineering graduate carrying out his master thesis at the MIT Media Lab, Changing Places Group. He is performing research on the Persuasive Electric Vehicle (PEV) project, working on the mechanical design and fabrication of interior and exterior systems.

In particular, he is focused on developing an active tilting system for the PEV. Combining a robust control strategy and a simple front suspension design, the tilting of this three wheeler vehicle will enhance the user´s experience, increase the stability in the curves and minimize the perceived acceleration by the driver.

Before joining MIT, Iñigo received his Bachelor of Science degree in Industrial Technologies from Tecnun-University of Navarra, in Spain. Among other projects, he has taken part in the design and fabrication of two Formula Student cars, as chassis team responsible. At the moment he is concluding a Master of Science in Industrial Engineering.

I graduated from Tecnun - University of Navarra in 2015 with a degree in mechanical engineering. I created this website as an online portfolio and resume to highlight the projects I have worked on. A summary containing many of the projects on this website can be found in the portfolio file below.

I have a bachelor’s degree in … from … in …

My research interests include

My name is … and I’m currently working as a … at the … . In … I graduated from the … at … with bachelor degree in … and a GPA of … .

In … I became a researcher at…

Through my research experience at … I worked with everyone! I've met people from so many different fields and work side-by-side with engineers, physicists, architects, and city planners. The problems we tackle are complex, it's in the name and it shows by the number of different approaches we take.

A lot of Engineers and Computer Scientists, at the center come up with really cool models, really cool simulations and insights. However, they do it in a way that's difficult to understand for non-engineers. The work is in the dark. That's where I come in shining a light.

To explore my research world more click here.

I am an engineer, designer, and researcher who enjoys working on problems at the intersection of design and engineering — particularly in robotics and data. Over the years, I have worked on a series of projects in this space including

Currently, I am a graduate student at the MIT Media Lab in Cynthia Breazeal’s Personal Robots Group. Prior to this, I worked at Palantir Technologies in New York City, Paris, D.C., and Palo Alto. In 2014, I graduated from UC Berkeley with an undergraduate degree in Industrial Engineering & Operations Research. While there, I worked with Ken Goldberg at the Berkeley Laboratory for Automation Science and Engineering and was part of the Berkeley Innovation team. I also spent summers working at various startups including Rypple and Loose Button.

Outside of my work, I can be found volunteering with the Field Innovation Team on disaster relief projects. I love to travel, photograph my adventures, and illustrate my experiences with doodles and tiny handwriting. I also have a passion for all things artsy and have recently been playing around with laser cutters, 3D printers and wood burning.

I'm a recent graduate of Northeastern University's College of Computer and Information Science, currently working as a research assistant at the MIT Media Lab. I'm interested in building technological platforms that leverage what we know about social dynamics to help people live their lives better. I'm currently working at the Human Dynamics Group at the MIT Media Lab, contributing to a mobile health study partnered with MGH and CATCH Health, working on a system for visualizing real-time social interactions, and analyzing human mobility patterns from high-density mobile phone data. I've also worked with the Lazer Lab, investigating how congresspeople's public statements can be automatically analyzed to infer partisan dynamics and socio-political network structure. I've worked as a CCIS Fellow, providing mentorship and career advice to younger students, and as a software developer at LEIDOS, a defense contractor, developing a management interface for an autonomous boat as part of the ACTUV contract.



Proyects AÑADIR TAGS

Electric Formula Student Frame Design + Fabrication – MECHANICAL DESIGN

Tecnun Seed Racing is a project with the purpose of designing and building an electric car and taking part at the Formula Student competition. We start from scratch and we end up with a car that is able to compete on F1 circuits such as Montmeló - Barcelona.

Since I really enjoy mechatronics, two years ago I joined Tecnun Seed Racing, where I was responsible for the mechanical design and manufacturing of the frame, and managing the chassis team.

Frame design objectives:

* To meet safety requirements
* To guarantee enough stiffness for an appropriate lateral load distribution and suspension sensitivity
* To keep an ergonomic driving environment
* Easy to manufacture geometry.
* Clever packaging: ensure an easy accessibility of the electric drivetrain components.

Most decisive factors during the frame design process:

* Position of the driver
* Powertrain concept
* Suspension points required for the desired tyre behaviour

Tubular steel space frame:

* Weight: 35 kilos
* Torsional stiffness target of 2200Nm/deg; validated 1900Nm/deg stiffness by CAE FEA model.

All the tubes were optimized with regard to their position in the structure using ANSYS. The process for the optimization of the frame has been done by changing the geometry and section of those tubes which are not stipulated by the rules.

The ergonomic design of the cockpit was studied using an adjustable custom made mock-up. It enhances the free movement of driver`s head, arms and legs, having a fully adjustable pedal box to accommodate different size drivers.

The frame was manufactured using cold-drawn seamless tubing, which presents the required mechanical properties and shows good welding behavior.

miniPEV: Active Tilting Tricycle Concept – MIT Media Lab - MECHATRONICS

The miniPEV is a concept small scale vehicle that shows the idea behind three wheeler vehicles with active tilting systems. miniPEV stands for mini Persuasive Electric Vehicle, and is a one-quarter scale prototype of the real scale Persuasive Electric Vehicle (PEV), which is an agile, on-demand, shared and functionally-hybrid tricycle.

The PEV is an ultra-lightweight, shared-use, autonomous electric vehicle designed to move both people and goods in high density cities, reducing the need for private automoviles and minimizing energy consumption for transportation. The PEV is being developed by the Changing Places group at MIT Media Lab http://cp.media.mit.edu/pev/, and I am designing its active tilting system.

Why include a tilting system in a tricycle?

Stability

A narrow track vehicle like PEV tends to roll over when taking a curve at high speeds. When riding a conventional bicycle, this does not happen. Having only two wheels allows the bike to lean in a curve, gaining stability. With a tricycle, we have a problem if a wheel gets off the ground.

User Confort

The user can have a sensation of inestability because of a high perceived acceleration in the curves

The miniPEV tries to give a solution to this issue, by actively leaning the body in the curves.

What do we need?

Vehicle Dynamic Model: bicycle + inverted pendulum

Roll Actuator

Special Suspension Design

Inertia Measuring Unit: The angular and the forward velocity are captured, to then calculate the appropriate tilting angle in each moment.

STRAIN ENGINEERING OF MAGNETO-OPTICS – CIC nanoGUNE - FUNDAMENTAL PHYSICS RESEARCH

During the summer of 2014, I developed a fundamental physics research at nanoGUNE http://www.nanogune.eu/ nanomagnetism group.

Main goal: to fabricate thin Co films with varying interatomic distances.

Use of pure Cr as an underlayer, varying its thickness, so that the lattice spacing of the Cr atoms can be varied at the interface to the subsequently grown Co-film.

After fabrication of the novel materials with varying atomic lattice, study of their optical and magneto-optical properties, by means of a unique Laser-based experimental tool at nanoGUNE, the so-called Generalized Magneto-optical Ellipsometer (GME).

Project Description

Materials properties of functional materials, such as semiconductors, superconductors or ferromagnets can be tuned by modifying their crystal lattice structure. Such material modifications are simply the result of the Quantum Mechanical rules that describe the “quantum” states of interacting electrons in large systems (many atoms), because the overlap of their wave functions is controlled by the distances of the atoms in such a lattice. Thus, all relevant materials properties such as conductivity or color can be modified by changing the atomic lattice.

There is a very elegant way to change inter-atomic distances in a solid by simply depositing material A on top of a substrate made of material B and thus forcing the atoms of type A to form an atomic lattice given by B. In this way, one can produce a new material that is made of atoms A, but has very different properties, because its interatomic distances have been changed. This is actually a very important fabrication technology today, which is used in electronic circuits, solid-state lasers and magnetic hard disk drives.

By means of modern fabrication techniques and tools, such as nanoGUNE ́s Ultra High Vacuum Sputter deposition system, one can produce such novel materials in a well-controlled manner. In addition, post-deposition characterization techniques, especially X-ray diffraction, enable the control and characterization of these new materials by measuring their interatomic distances.

Linkedin Summary:

Summer Internship at Nanomagnetism Group

The main goal of the project was to fabricate thin Co films with varying interatomic distances. For this, I used CrRu-alloy template layers as substrates, so that the variation of the alloy concentration allows for a pathway to tune the interatomic distances of the Co film in a continuous fashion. As an alternative approach, I used pure Cr as an underlayer, but vary its thickness.

Given that the Cr-underlayer itself is grown epitaxially onto a Ag-layer, it is strained and its own strain state will be thickness dependent. So, by simply varying the Cr-underlayer thickness, we can vary the lattice spacing of the Cr atoms at the interface to the subsequently grown Co-film. Thus, a simple Cr-underlayer thickness series might allow us to vary the strain state of Co-films, which would also make the experiment overall simpler because the optical constants of the underlayer would not be varied in any substantial way.

After fabrication of these novel materials with varying atomic lattice, we studied their optical and magneto-optical properties, which were measured by using a unique Laser-based experimental tool at nanoGUNE, the so-called Generalized Magneto-optical Ellipsometer (GME). This extremely precise instrument measures light polarization changes, which are caused by the magnetic properties of materials.

Statistical Analysis Between Wind Turbines in a Wind Farm – NEM SOLUTIONS – DATA MINING AND MACHINE LEARNING

This project was developed in the company NEM SOLUTIONS <http://www.nemsolutions.com/> during the summer of 2016. The main objective was to research and define failure indicators by means of statistical analysis and similar behavior of the different wind turbines in a wind farm.

I explore the failure prediction quality of techniques based on the operation of the wind farm as an entity, comparing one variable for the different machines in a wind farm, and indicating as anomalous the wind turbines that divert from the normal behavior of the wind farm.

Prior to this project, the company´s neural network was responsible for the monitoring and the prediction of failures in wind farms, by studying individually each wind turbine and deciding, based on a trained model, if it was failing or not. Therefore, with this approach each wind turbine was isolated from the rest of the wind farm.

This project considered another perspective. Doing statistical analysis in order to find wind turbines with similar behavior. In this way, comparing the behavior of similar wind turbines could indicate anomalous wind turbines if they separate from the normal behavior of the wind farm

If a wind turbine does have a failure of some kind, the normal behavior of the rest of its neighbors will tell that it is actually failing.

First, we used multiple linear regression, using all the wind turbines to predict one of them. Good results, but does not deal with missing data, which is a common symptom in the data.

In order to avoid that, an alternative is to use Simple linear regression. Each asset of the wind farm contributes to the response. The contribution is weighted with its Pearson Correlation Coefficient to the predicted asset.

Computational Cancer Biology - Bioinformatics Department – CEIT <http://ceit.es/en/industrial-sectors/health-a-food/bioinformatics>

I first did a general statistical analysis training, using R as a test-bed, and applying numerous machine learning techniques, in order to see their pros and cons when facing supervised classification problems.

After this training period, I focused on the real project, concerning breast cancer:

Breast cancer patients with the same stage of disease can have markedly different treatment responses and overall outcome. Despite a significant improvement in cancer survival in the last 20 years, anticipate the outcome of the treatment still constitutes an open question.

On this point, van’t Veer et al. (2002), used DNA microarray analysis on primary breast tumours of 117 young patients, and applied supervised classification to identify a gene expression signature strongly predictive of a short interval to distant metastases (poor prognosis signature) in patients without tumour cells in local lymph nodes at diagnosis (lymph node negative).

In this project, gene expression data was summarized by using a set of elementary flux modes (EFMs). In particular, a sufficiently large set of EFMs was calculated for the production/consumption of each metabolite that can be excreted/absolved by the cell. Then, the gene expression datasets obtained from 78 patients with breast cancer were projected onto the EFMs as done in Rezola et al., (2013).

Main tasks with the dataset:

- Identify differentially expressed metabolites between patients with good and bad prognosis, using t-test and control false discovery rate.

- Principal Component Analysis to reduce the number of variables (metabolites)

- Evaluate whether mean p-values of metabolites can separate patients using the first two principal components

- Identify the most accurate logistic regression model to classify prognosis of patients.

- Use Support Vector Machines with a Gaussian Kernel to classify patients based on prognosis.

NEW YORK SUBWAY CHALLENGE - OPERATIONS RESEARCH

* The New York Subway Challenge is a competition where participants must pass through all the New York Subway stations in the shortest time possible.
* In order to find the optimal path for the New York Subway Challenge, a linear optimization method has been developed.
* Each station has been considered as a node of a graph, and the time needed to travel between stations as the arc weights.
* This solution relies on the transformation of the original graph into its directed line graph. Working with the directed line graph allows the use of an easy ILP formulation to solve the Subway Challenge.

Applied Mechanics Department – Student Intern – MECHANICAL DESIGN AND CONTROL

* Fatigue strength testing for ‘butterfly’ type valve, used in train shock absorbers.
* Design and fabrication of the test bench.
* Control of the servomotor with Single-Board RIO Controller and LabVIEW.

FALTAN FOTOS!!!

GRINDING MACHINE DESIGN– DANOBAT

<http://press.danobatgroup.com/danobatgroup-collaborates-in-the-training-for-the-tecnun-industrial-engineering-masters/>

Best conceptual design and precision engineering project awarded by DANOBATGROUP, to the students of the TECNUN Industrial Engineering Masters course. The project involved taking on a practical challenge by the 33 students, who had the opportunity to develop their knowledge and put it into practice. The project was of technological value for the Machine-Tool sector within the area of Design and Precision Engineering of a grinder.

* Main Goal: Conception, design and presentation of a grinding machine for train axles.
* The machine had to be designed so that axles with different geometries could be manufactured in a roboticed and automatic environment.
* Axles dimensions and tolerances were provided by the company Danobat Group, which is one of the most important European largest machine tool builder.

- The design development has been implemented following the 11 Principles of Precision Machine Design:

1. Structure

2. Kinematic / Semi Kinematic Design

3. Abbe Principle

4. Direct Displacement Transducers

5. Metrology Frames

6. Bearings

7. Drives / Carriages

8. Thermal Effects

9. Servo-Drives and Control (CNC)

10. Error Budgeting

11. Error Compensation

**FISHING REEL DESIGN**

* Goal: From scratch design a fishing reel with PTC Creo Parametric.
* By modeling a fishing reel, we studied its cinematic mechanisms in order to design a 3D model using CAD with the help of PTC Creo Parametric software.
* Modeling the different pieces and mechanisms which makes up the fishing reel was the key point of the process.
* The modeling of each piece started and several tests to check the functioning of the skeleton and the functional parameters were successfully carried out. Finally, the fishing reel was reassembled.
* The end product is a fishing reel enabling the user to introduce the species desired to catch, which then activates a mechanism allowing the modification of the form of the reel in order to have enough fishing line.
* Mechanism design
* Visual appeal
* Ergonomic
* Ease of use
* Thanks to the great teamwork the project was given the best possible mark.

**GRIPPER TOOL DESIGN – 3D RAPID PROTOTYPE PRINTING**

* Design of a gripper tool for an industrial robot for picking and placing cylindrical parts of 50 to 80 mm, 150 mm long and 1 kg of weight.
* The final design of the gripper tool was used in a robot cell-simulation program and was assembled on an industrial robot from Fanuc, Fanuc LR Mate 200iB.
* Kinematic Analysis
* Dynamic Analysis
* Motor Selection
* After all the studies, the gripper was adapted to be fabricated in a 3D rapid prototyping printer.
* Good results obtained, the mechanism worked perfectly and the geometry was appropiate for the targets.

**ACOUSTICAL INFLUENCE OF THE GEOMETRY OF A CLARINET BB REED BY MEANS OF A PARAMETRIC ANALYSIS**

* The reed is one of the most important elements that form a clarinet, and its geometry is the key to the correct production of the sound.
* First a theoretical model (Four-Pole Method) is used to study the acoustic performance of the clarinet. Then, an acoustic model has been created and a parametric modal analysis of the reed has been carried out. Moreover, an harmonicity study was performed out the experimental data.
* The obtained simulations have been validated by means of experimental data from a real Bb clarinet.

**PROJECT PROPOSAL: INTELLIGENT TRAFFIC LIGHT FLOW CONTROL WITH A WIRELESS SENSOR NETWORK**

Design of an intelligent traffic light control system based on Wireless Sensor Network (WSN).

The proposed system consisted of two parts:

Wireless Sensor Network

Control box running control algorithms

The WSN, which consists of a group of traffic sensor nodes (TSN), was designed to provide the traffic communication infrastructure and to facilitate easy and large deployment of traffic systems.

In the proposed scheme, each TSN mainly collects the traffic data, vehicle speed, and length of the vehicles, based on processing of the sensor data. Then the collected data is sent in real time.

These nodes are installed in the roadbed in a safe manner for detecting and communicating traffic information for decision making.

Soraluze Video

Dvorak Work

LABVIEW – Electrónica

Nave industrial: Structures

Crowdsearch - HackMIT Best Use Of Firebase

Collaborated with 3 other team members from different universities to create a web platform that helps people collaborate to find missing persons using React JS and Firebase. Won “Best Use Of Firebase” award by Firebase/Google team.

<https://hackmit-crowdsearch.firebaseapp.com/0>

<https://devpost.com/software/crowd-search-zjq3ro>

<https://github.com/ekmartin/hackmit-crowdsearch>

**Inspiration**

Last October, a 16 year old girl went missing outside Oslo, in Norway. Her parents posted about it on Facebook, and it was quickly shared by thousands of people. An immense amount of comments scattered around a large amount of Facebook posts consisted of people trying to help, by offering to hang up posters, aid in the search and similar. A Facebook group was started, and grew to over 15 000 people within a day. The girl was found, and maybe a few of the contributions helped?

This is just one example, and similar events probably play out in a large number of countries and communities around the world. Even though Facebook is a really impressive tool for quickly sharing information like this across a huge network, it falls short on the other end - of letting people contribute to the search. Facebook groups are too linear, and has few tools that aid in making this as streamlined as possible. The idea is to create a platform that covers this.

**What it does**

Crowd Search is split into two main parts:

* The first part displays structured information about the case, letting people quickly get a grasp of the situation at hand. It makes good use of rich media and UX design, and presents the data in an understandable way.
* The second part is geared around collaboration between volunteers. It allows the moderators of the missing person search to post information, updates and tasks that people can perform to contribute towards.

**How we built it**

Crowd Search makes heavy use of Firebase, and is because of this a completely front-end based application, hosted on Firebase Hosting. The application itself is built using React.

By using Firebase our application syncs updates in realtime, whether it's comments, new posts, or something as a simple as a task list checkbox. Firebase also lets us easily define a series of permission rules, to make sure that only authorized moderators and admins can change existing data and similar. Authentication is done using Facebook, through Firebase's authentication provider.

To make development as smooth as possible we make use of a series of utilities:

* We compile our JavaScript files with Babel, which lets us use new ECMAScript 2016+ features.
* We quality check our source code using ESLint (known as linting)
* We use Webpack to bundle all our JS and Sass files together into one bundle, which can then be deployed to any static file host (we're using Firebase Hosting).

**What's next for Crowd Search**

The features presented here function as an MVP to showcase what the platform could be used for. There's a lot of possibilities for extension, with a few examples being:

* Interactive maps
* Situational timelines
* Contact information

**Built With**

* [react](https://devpost.com/software/built-with/react)
* [javascript](https://devpost.com/software/built-with/javascript)
* [firebase](https://devpost.com/software/built-with/firebase)
* [sass](https://devpost.com/software/built-with/sass)
* webpack
* babel

**Try it out**

Other Minor Proyects

Centrifugal Pump

Informe LES Motor combustion

Popsicle Stick Bridge

Electromagnetics shuttle

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Electrica: Lineas y fotovoltaica

Trabajo Procesos??

Categories