# TALK BIT
## CONFERENCE

26 JAN 2019 PORTO

A BIT OF THE FUTURE

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

# ABOUT TAB

**Talk A Bit** *is a non-profit tech conference organized by graduating Software Engineering students from FEUP, the Faculty of Engineering of the University of Porto. Like in previous occurrences, this year's* **7th edition** *of the conference will focus on the* **future of technology.**

*The conference started in 2013 with less than 150 attendees, a number that has grown to 500 in last year's edition. The trend is clear and demonstrates how important it is to think about the future of technology, since today the technological world is becoming more and more a part of our lives.*

# INTRODUCTION

## Let's talk a bit about the future of technology

Once upon a time, the internet was wired, maps were paper-based, you'd have to get out off your couch to rent a movie, and television was black and white. At times it can be hard to believe just how small these beginnings were, but there is no denying that technology has come a long way in such a (relatively) short amount of time: from the first Intel 4004 microprocessor in 1971 to the recent Intel Core i7, from the first personal computer in 1981 to the 2 billion ones sold in 2015, from the personal phone that cost $900 and weighed 510g to personal phones that cost $60 and weigh 160g. As a result, businesses have undergone significant transformations — with even new ones emerging, such as e-commerce — and become worthy of millions of dollars (Netflix, Amazon, Farfetch, Facebook, Apple, among others). Consequently, new concepts also emerged from this new technological era: remote work, artificial intelligence, augmented reality, internet of things, voice recognition, blockchain, and many others. But not all technology are success stories, just look at Google Glass or the Segway, or try to search through your repressed memories for the word "Clippy." Furthermore, some technology businesses that looked promising have now disappeared, either due to stronger competition, poor management, or just a rough execution of its core idea: MySpace, Altavista, Iomega, Napster, Compaq, Netscape, and so on. Regardless of success or failures, technology can also be threatening: due to today's free flow of information, some worry that privacy is becoming a precious commodity. Nevertheless, for better or worse, technological progress has and will keep on having a fundamental impact on society as a whole, aiming to accomplish more and to streamline everything. On one hand, there is the possibility of reaching new heights: Elon Musk wants to go to Mars, the automotive sector wants to create self-driving cars, Richard Branson wants to cover the world with Wi-Fi. On the other hand, there is the risk of negatively impacting the life of many, such as the fear of the working-class losing jobs to automated processes. In fact, a 2013 Oxford University study concluded that, in the U.S., about half of all jobs will disappear in the next 10 to 20 years due to computerization, and will hardly be replaced by the creation of new work opportunities. Either way, there are a great deal of questions about the future, and an abundance of ways to get there. While we don't have the ability to predict the future, we can discuss paradigms, speculations and emerging trends, here in Talk A Bit.

# FORUM

# WHEN FACTS BECOME OPINIONS

## TOPIC OF DISCUSSION

Regarding the theme of ethics in technology, this year's discussion forum debates the impact of technology on fake news and similar exploits.

## DANIEL CATALÃO

Journalist at RTP

## ÁLVARO FIGUEIRA

Professor at DCC-FCUP and INESCTEC research in Social Network Analysis

## RUI SILVA

Assistant Professor at FLUP

## FILIPE ARAÚJO

Vice-President of the Municipality of Porto and Councilor in the fields of Innovation and Environment

## RAUL VIDAL

Professor Emeritus and Coordinator of Alumni relations at FEUP, Mentor of Talk-A-Bit

## GABRIEL LEITE MOTA

PhD in Economics FEP, the only Portuguese specialist in Economics of Happiness

# KEY NOTES

“Talk A Bit is naturally characterized by its talks. Here we present this edition’s speakers who will cover all sorts of topics about the future of technology.”

# LET'S TALK A BIT ABOUT

## CONNECTED CARS

**RUI CORDEIRO**

**CEO at Critical TechWorks**

In his current role as CEO, Rui leads an amazing team at Critical TechWorks, people devoted to developing the next generation of software systems for the BMW Group's future driving machines. Rui has spent over 20 years working in fast-growing companies focused on software-intense, safety-critical systems. His experience spans several domains, such as automotive, aerospace, space, defence and rail. In the last two decades, Rui has held many different roles including Software Engineer, Project Manager, Quality Manager, Engineering Director, PMO Director and Business Development Director. Rui also undertook a sabbatical focused on Diagnostic Engineering, Aftermarket Technology and Volvo Trucks Technology. Between 1998 and 2018, Rui worked for CRITICAL Software; an integral part of the company from its early days, he became part of the company's management board in 2005. In 2017, Rui led the building of CRITICAL's presence in Germany, working with customers such as BMW AG, Continental, Bombardier, Infineon, Aerospace Embedded Solution, Knorr Bremse. Rui then took his expertise to Critical TechWorks when it was founded in 2018. During his time with CRITICAL, Rui contributed to several subsidiaries and technology start-ups including Watchful Software, Critical Materials and Educed. Rui is a member of the board of CRITICAL Holding since 2007.

# LET'S TALK A BIT ABOUT

## ARTIFICIAL INTELLIGENCE

ARLINDO OLIVEIRA

President at Instituto Superior Técnico

Arlindo Oliveira is interested in technology, and in the way technology is changing the way we are. He was born in Angola, and has lived in Mozambique, Switzerland, the Bay Area, and Lisbon, Portugal.

Arlindo got his degrees in engineering from Instituto Superior Técnico, in Lisbon, and from the University of California, Berkeley. Arlindo's academic work is focused on digital systems, algorithm design and machine learning techniques.

# LET'S TALK A BIT ABOUT

## BLOCKCHAIN AND THE WEB 3.0

ANDRÉ SILVA
Software Engineer at Parity Technologies

André Silva is a Software Engineer, graduated in 2011 at Faculdade de Engenharia da Universidade do Porto. Currently, he collaborates with Parity Technologies (https://parity.io/), where he develops open-source software for parity-ethereum (https://github.com/paritytech/parity-ethereum), one of the Ethereum implementations, and substrate (https://github.com/paritytech/substrate), a framework for the development of distributed applications.

# LET'S TALK A BIT ABOUT

## GREEN SOFTWARE

RUI PEREIRA

Reserarch and co-founder of the Green Software Lab

Rui is a Postdoctoral computer science researcher at the University of Minho and HASLab/INESC Tec. He received his PhD degree with the thesis entitled “Energyware Engineering: Techniques and Tools for Green Software Development” under the MAPi doctoral program from the Universities of Minho, Aveiro, and Porto, financed by FCT. During his PhD, he worked on analyzing, understanding, and optimizing software energy consumption levels through source code analysis and manipulation techniques. Additionally, is one of the co-founders of the Green Software for Space Control Mission (GreenSSCM) project, the Software Repositories for Green Computin FLAD/NSF project, and the Green Software Lab (GSL) project and research group. Currently, he is working on the GreenHub project and his research interests focus on green computing, human-computer interaction, and source code analysis and manipulation.

# LET'S TALK A BIT ABOUT

## TRANSDISCIPLINARY APPROACH TO INNOVATION

CLARA GONÇALVES

Executive Director of UPTEC

Clara Gonçalves (Degree in Agronomic Engineering, Sciences School of University of Porto) is the Executive Director of UPTEC - Park of Science and Technology of University of Porto. During the last years she is working in the implementation of an effective knowledge and technology transfer model between academia and business, supporting more than 500 tech-based start-ups and spin-offs and attracting Innovation Centers from national and international enterprises to the University of Porto ecosystem. For the past 11 years Clara was involved in several seminars and conferences as a speaker and organizer in Portugal and abroad, was member of the Scientific Council of the Fine Arts School of the University of Porto, organized several entrepreneurial programs with Post Doc, PhD, Masters and Under Graduated students and lead the establishment of international partnerships with universities, companies and technological organizations in a national and international context. In 2016, Clara made the International Visitor Leadership Program (Washington, San Francisco, Albuquerque, Detroit and New York), invited by the U. S. Department of State (USA).

# LET'S TALK A BIT ABOUT

## PERSONALIZED EXPERIENCES THROUGH AI

SÉRGIO VIANA

Associate Partner & Microsoft Solutions Lead at Xpand-IT

Sérgio Viana is a Software Engineering graduate from Instituto Superior Técnico. Enthusiast and Evangelizer in the Digital Experience area, Sérgio has more than 10 years of experience in managing projects and teams. He established the partnership between Xpand IT and Microsoft Portugal, turning Xpand IT into a major partner at the european level.

# WORK SHOPS

# LEARN HOW TO BUILD A COMPUTER ENTIRELY OUT OF DOMINOES.

A workshop provided by one of our partners, **IEEE University of Porto - Student Branch (IEEE UP SB)**! "Learn how to build a computer entirely out of dominoes" is a workshop that will teach you how to build a computer using only dominoes! At the end of this workshop, we will bring together a team to try to beat the world's greatest computer dominos record!

## INFO

### Room

**B111**

### Schedule

**10:35 am - 12:00 pm**

### Limited to

**20 individuals**

### Requirements

No requirements needed.

IEEE
University of Porto - Student Branch

# EVOLVE SOFTWARE TO SCALE ON TEAMS

A workshop provided by one of our gold sponsors, **Farfetch!** You should bring your own computer and have a minimal knowledge in software development.

## INFO

### Room

B109

### Schedule

09:15 am - 10:25 am

### Limited to

20 individuals

### Requirements

- Personal Computer
- Minimal knowledge in software development

FARFETCH

# DESIGN SYSTEMS 101: FRONT-END AS A TEAM SPORT

A workshop provided by one of our gold sponsors, **Hostelworld!** The prerequisites consist in bringing your personal computer and being familiar with software development.

## INFO

### Room

B110

### Schedule

09:15 am - 10:25 am

### Limited to

20 individuals

### Requirements

- Personal Computer
- Minimal knowledge in software development

HOSTELWORLD
MEET THE WORLD


PROCEEDINGS

"This year, Talk A Bit made a call for papers related to this edition's main theme. A journal with the full papers will be published on talkabit.org, February 2019. Here we present each paper's abstract."

## The necessity of artificial intelligence regulation: an open AI approach

José Aleixo Cruz

Artificial intelligence (AI) is a fast-growing paradigm of which humans have only explored the tip of the iceberg. An AI-driven future opens up several possibilities for the entire human species. However, we should not underestimate the power of AI and efforts should be made to regulate it as soon as possible and in the best achievable way. We propose the creation of an intergovernmental organization with open-source and democratic ideals, analyze its structure and suggest how this organization should elaborate laws in the fairest way possible for the global community.

## From Monoliths to Microservices: A Migration Overview

João Pinto, Tiago Matias

Microservices is an architectural style inspired by service-oriented computing that has increasingly gained popularity. Migrating monolithic architectures to cloud-native architectures like microservices brings many advantages such as the flexibility to adapt to the technological changes and independent deployment for different system components and high availability for the system. Employing modern software engineering paradigms and Web technologies such as domain-driven design, RESTful HTTP, polyglot persistence, a continuous DevOps approach to service delivery and robust fault management to this environment is a non-trivial task. However, these paradigms and technologies also create further design choices that have to be made. It is necessary to investigate the microservices architecture and its respective implementation details, and also ascertain patterns that can and should be considered during development.

## What if refactoring, infovis, quality metrics and liveness came together?

Ana Rita da Costa Torres, Miriam Cristiana Meireles Campos Gonçalves, Sara Filipa Couto Fernandes

Programming and software analysis have always been a part of life for both programmers and programming students. However, in a system with large dimensions and complexity it is difficult to change the features of the system, even for more experienced programmers, since sometimes their code has not been implemented or organized in the most correct way, needing to be restructured before making any changes in the system. This restructuring is known as refactoring. There are already several tools that allow a programmer to receive some refactoring suggestions, but these restructuring proposals are made after the developed code is compiled and not in programming-time and with these tools the programmer cannot know which of the refactorings suggested is the best one to be executed. In order to investigate further on this subject, encompassing topics such as live software development, refactoring, quality metrics analysis and information visualization, a literature review about this themes was carried out, in order to understand what has already been done in those areas a'nd how they can be combined to benefit programmers or programming students. With this research and with the analysis of the obtained results, it was verified that in the level of live programming there is still much that can be done, especially if this type of programming is allied to topics like refactoring and, consequently, analysis of quality metrics and information visualization.

## A Bit Of Gamification

Daniela Maia, Tiago Moreira

This document summarizes a theme that can be present everywhere in our daily tasks, the Gamification. Why to use this and how, why is this so important and what impact can this make in the future... This questions are answered and debated in this document.

## The future of industry and its societal impacts

Andreia Rodrigues, Antonio Melo, Eduardo Leite, Nuno Ramos

Industry 4.0, also known as Smart Manufacturing or Smart Production, is the name given to the recent developments in production and automation who have led to the fourth industrial revolution. This makes it a very broad domain since it includes a variety of technologies, some of them being production processes, internet of things, data management, relationship with consumers, competitiveness and artificial intelligence. It is now a very hot topic, because of its potential to reduce manufacturing lead times, improve product quality and organizational performance. Because its a recent concept, companies are still transitioning to these new ideas and the very definition of Industry 4.0 is still changing. And so, the aim of this paper is to give an overview of the state of Industry 4.0 and its domains and respective current developments.

## Neural Networks for Music Generation

José Costa, Tiago Grosso, Vasco Ribeiro

Artificial neural networks are a powerful tool that have found increasing use in a vast amount of applications. However, research and development of neural networks and their uses still has long ways to go. Recently, neural networks have been used in image generation and transposition, sometimes with stunning success. But while image generation has had a place in the spotlight of content creation neural networks, there are other fascinating applications being investigated for quite some time.

There are neural networks for text generation, procedural environment creation and music composition. Algorithmic music generation by means of a neural network poses some interesting challenges. While an image can be interpreted as an NxM grid f pixels, which allows for the use of, for example, convolutional neural networks in their processing, modeling music is not as straightforward since it is not feasible to feed complex sound waves into the networks input layer Many approaches attempt to solve this problem by transforming music into an image, with the height of each pixel being the pitch and the horizontal axis representing time. While some success has been made by this ttempt with the use of convolutional neural networks, generated music does not have a very good feel for the progression of the melody over medium and long periods of time. Other efforts approach the problem by describing music in text. For example, one could transform a MIDI file into a CSV file and use each line of that file as an input into the network. However, due to the nature of the file, the sense of harmony is somewhat lost to the network. There are currently many project each with their own distinct attempt at modelling music and creating a neural network that composes at a level that is indistinguishable from a human composer or at least something that is close to that. Another other major challenge is the training sets used. If a neural network is trained by analysis of Mozart's music then it becomes little more than a copy of Mozart. If one varies and feeds it music from Bach, Mozart, Beethoven, etc., then the neural network will be more diverse but will still not be able to drift from classical sounding music. The many attempts at solutions to these and more problems with music generation via neural networks are described and discussed in this literary survey, with several distinct models for music and different approaches at the type of neural network used. A history of algorithmic music composition is also presented as a way to frame context and explain the path that lead to some of the current projects. A perspective for the future is presented based on past and current developments in this field of study.

## The Technology at the service of Cardiology

### Adélia Gonçalves

In September this year, at its annual news event, Apple announced a new feature of Apple Watch: electrocardiograms. The American Association of Cardiology and the FDA approved the new functionality. For Google founder and CEO Larry Page, the use of health data for the advancement of medical research “will save hundreds of thousands of lives.” The new sensors and technological advances available to health providers bring new paradigms on how to treat information and how it can be used. New tools can be used for better cardiology. The role of technology in health, focus on cardiology, and the benefits that new technological advances can serve the masses are going to be will be reviewed and discussed.

## Towards the industrial future: a survey on Industry 4.0 and its current status

### Rafael Rocha, Marco Gonçalves, Bruno Coelho

All manufacturing companies, be it large or small, are under constant pressure from their customers for their products to be better quality, lower cost and available quicker. The forth industrial revolution, Industry 4.0, aims to enable manufacturers to deliver these customer requirements by employing a digital, software-based framework to their factories, through technologies such as Internet of Things, Cyber-physical systems, Big Data and cloud computing. Currently, Industry 4.0 is understood in general terms as the “digitization” of a business’ infrastructure, however there are still no reliable standards or definitions applied to what remains an arguably vague concept for businesses worldwide. This paper attempts to clarify what Industry 4.0 is by describing its core technological pillars and what it implies in terms of logistics and enterprise applications. Furthermore, the paper explores the financial benefits that Industry 4.0 can bring to different industrial sectors, its current adoption, its impact and potential controversies surrounding it, and finally its future.

The paper concludes that while there are still multiple obstacles and oppositions to its adoption, Industry 4.0’s advantages are extremely promising in terms of economic growth, leading to world governments pursuing ways to improve the digitization process of the industry.visualization, a literature review about this themes was carried out, in order to understand what has already been done in those areas and how they can be combined to benefit programmers or programming students. With this research and with the analysis of the obtained results, it was verified that in the level of live programming there is still much that can be done, especially if this type of programming is allied to topics like refactoring and, consequently, analysis of quality metrics and information visualization.

## The Future of Marketing Technologies

### Leonardo Machado

In this paper we discuss the current state of Marketing Technologies (martech) and how these will evolve in the future. We introduce some fundamental marketing terminology, proceeding to then discuss the concept of martech at a more in-depth level. Martech are tools and efforts used to improve the efficiency of all marketing divisions, and as such, an introduction is provided to all six main sectors that are encompassed by marketing activities. Having provided a sound basis on the state of martech, the article then proceeds to discuss how it will evolve in the future by presenting two distinct, yet complementary, predictions. The first one being about how the data sector will work towards creating a more holistic understanding of all of the data that comes from multiple information sources to create stronger and more reliable data models for all marketing sectors - in contrast with the most common single-source-focused approach used today. Secondly, we predict that once these data models have been created, management martech will become pivotal in turning all of the knowledge contained in these models into automated actions, allowing for the creation of AI-powered martech systems. These systems will then help companies focus on their primary marketing efforts by providing relevant insight in decision making processes.

## The future of Accelerators and their application to Smart Cities

Daniel Fernandes, Fábio Caramelo

The history of computation has been, for the most part, dominated by central processing units (CPUs). These devices have always been popular due to their flexibility, allowing programmers to develop a wide range of applications so far. Nowadays, however, performance and energy efficiency is becoming more critical in many computing systems, especially in embedded domains. Software engineers have thus started moving towards accelerators to improve their systems. This paper presents an overview of accelerators and their use in several application domains, with a focus on machine learning. We provide a brief introduction to two common accelerators used nowadays: graphical processing units (GPUs) and field-programmable gate arrays (FPGAs). We also give a short summary of what these architectures have been used for, their advantages over traditional processing units, as well as their drawbacks. As an application example, we dive into the smart cities domain, explaining how this could be one area to benefit from these architectures, especially looking into the future. On that note, we also discuss the future of accelerators themselves and how they will need to evolve to be adopted by more application domains.

## Cloud Computing: Advantages, Disadvantages and Prospects

Alexandre Ribeiro, Diogo Campos

Programming and software analysis have always been a part of life for both programmers and programming students. There are already several tools that allow a programmer to receive some refactoring suggestions, but these restructuring proposals are made after the developed code is compiled and not in programming-time and with these tools the programmer cannot know which of the refactorings suggested is the best one to be executed. In order to investigate further on this subject, encompassing topics such as live software development, refactoring, quality metrics analysis and information visualization, a literature review about this themes was carried out, in order to understand what has already been done in those areas and how they can be combined to benefit programmers or programming students. With this research and with the analysis of the obtained results, it was verified that in the level of live programming there is still much that can be done, especially if this type of programming is allied to topics like refactoring and, consequently, analysis of quality metrics and information visualization.

## Self-driving cars: a benefit to society?

Jorge Ferreira, Pedro Lima, Luís Barbosa

Will self-driving cars change the future of transportation? As we all are aware, cars play a very important role in the life of the human being, not only for their possibility of transporting people but also for the transport of material. With the emergence of self-driving vehicles, ethical issues arise. All over the world, there have been debates about whether or not we are prepared for them. 69% of respondents stated that fully automated driving will reach a 50% market share before 2050 and revealed a concern about software hacking/misuse, legal issues, and safety. Through this opinion paper, we approach this theme, aiming to make an overview of the research in the area, introducing some of the automated mechanisms currently adopted by some car brands and the five autonomous driving levels explained in a detailed way as NHTSA defined them. Also, we will indicate if this technology will benefit society and how, and the possible drawbacks from its use based on investigation already made in the area during the past years.

# ABOUT THE TEAM

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Ana Rita Torres - Member

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Henrique Cardoso - Member
João Pinto - Member
Tiago Moreira - Member

## Social program
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