

BROADENING CS EDUCATION AND OUTREACH: A INFORMATICS DEPARTMENT PERSPECTIVE

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Departamento de Informática
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa



NOVALINCS
LABORATORY FOR COMPUTER
SCIENCE AND INFORMATICS

ECSS 2017 Lisbon

The Department

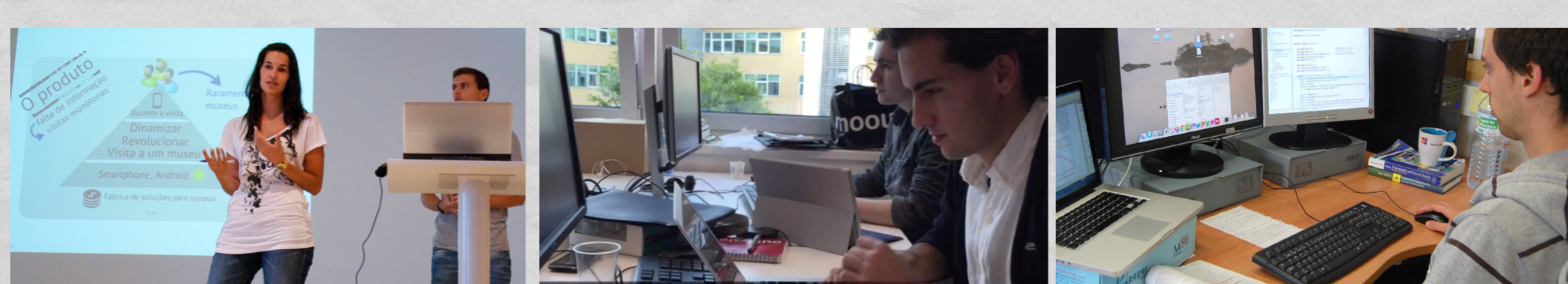
- Pioneer in Informatics education and research in Portugal
 - Integrated Master in CS and Informatics (180 in/y)
 - PhD Program in CS (80 students in pipeline)
 - “Introduction to Informatics” to 10 Eng Programs (800 in/y)
 - NOVA Laboratory for Computer Science and Informatics
 - World class research + problem driven innovation

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 - NOVA Laboratory for Computer Science and Informatics
 - World class research + problem driven innovation
- We look for collaborative research with partner companies and outreach intensively to promote education and research
- We strive to integrate teaching, research and outreach
- Major goal: recruit stronger candidates, increase diversity, create deeper interest in computer science and informatics

APDC course (mid program)

practical activity for curricular development



- 18 ECTS 3rd year course (unique at national level)
- 20 Weeks hands-on activity outside class room environment
- Three options (competitively selected by students):
 - Internship in a partner company (> 100 agreements signed)
 - Innovation project in startup-like environment
 - Research project within a NOVA LINCS team
- ~ 100 students per semester

APDC course (mid program)

innovation project 2017



- Students work in specially prepared rooms
- Groups of 5-6 students
- Initial “academy” on cloud, security, web frameworks, testing
- Basic “problem” proposed by selected external partner
- Groups develop fully functional app + new functionality

APDC course (mid program) innovation project 2017



Início



Login



Mapa



Estatísticas



Emergência

Bem vindo à StreetFixer!

Há um buraco na sua rua a estragar os carros que passam?
Encheram a parede da sua casa de graffitis novamente?
O parque infantil é o depósito de lixo da zona?
Ainda ninguém tratou daquela árvore caída há 2 meses?

StreetFixer Para Android!

Obter App

Nós temos a solução!

- 2017 Project: Participative Event Management System

APDC course (mid program) innovation project 2017



- Final presentations workshop w City Council representatives
- Open to the school faculty, students, and partner companies

4th year Social Aspects Course



- Organised as a series of invited talks by “professionals”
- Ethics, Professional matters, Legislation, History, Social Impact
- Open to all faculty and students at the school

Informatics for Science and Engineering

- Course offered by Department of Informatics (6 ECTS)
- Replaced old “Computer Programming” course in 2011
- Mandatory for all 10 core FCT engineering programs
- **LEG** (Geological Eng), **MIEA** (Environment Eng), **LBCM** (Cellular and Molecular Biology), **LQA** (Applied Chemistry), **MIEQB** (Chemical and Biological Eng), **MIEC** (Civil Eng), **MIEM** (Mechanical Eng), **MIEGI** (Industrial Management Eng), **MIMN** (Micro and Nano Eng), **MIEM** (Materials Eng)
 - Common knowledge body / different application domains
- Special courses offered to some programs (OOP, Databases, Algorithms and Data Structures, Machine Learning)

Overview

- **Knowledge**
 - Thinking Computationally
 - The fundamental components of a computer system.
 - The tools of a software development system.
 - Basic concepts of imperative programming.
 - Some fundamental notions of relational databases.
 - Some basic concepts involved in the World Wide Web.
 - Some basic concepts involved in an API.

Overview

- **Application**

- Decompose a problem into simpler problems.
- Design an algorithm for solving a simple problem.
- Write small programs, making a correct use of the basic constructs of an imperative programming language
- Check (test) a program to see if it is working correctly.
- Define database tables and simple database queries in SQL
- Write programs that access resources on the Web.
- Write scripts and small apps that usefully explore an API in the student study domain (scope of final project)

Example (Seismic wave propagation)

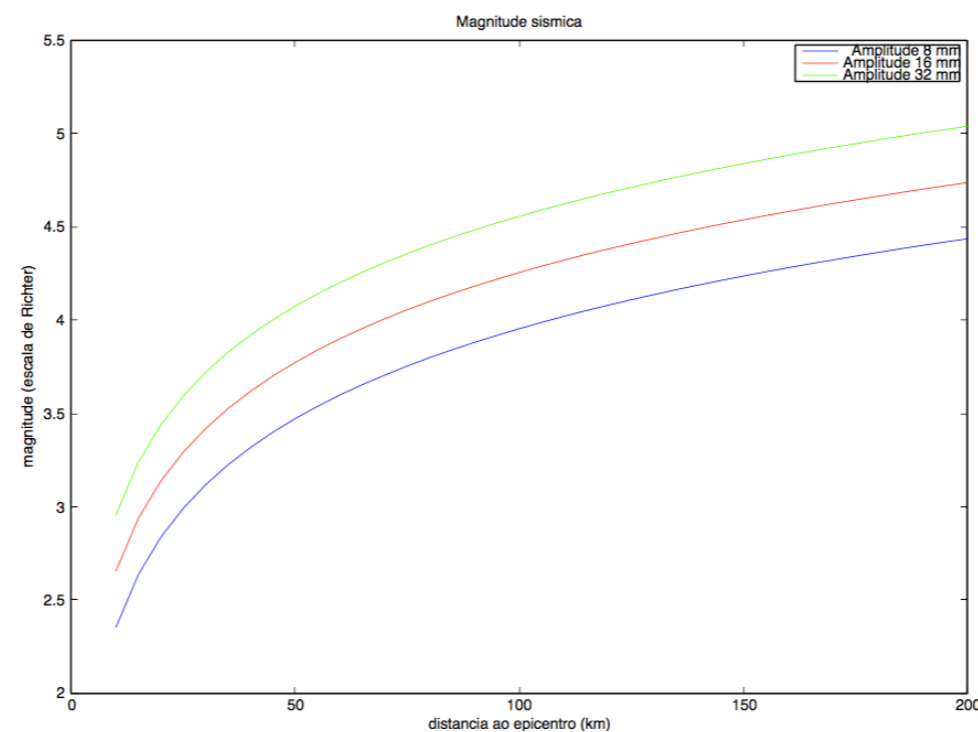
Exercício 3

Relembre o exercício 6 da Ficha Prática Nº 2, onde calculou a magnitude de um sismo por recurso à formula empírica de Lillie, a qual se reproduz seguidamente:

$$M = \log_{10} A + 1.6 \log_{10} d - 0.15$$

onde M é a magnitude (na escala de Richter), A é a amplitude das ondas sísmicas (em milímetros) e d é a distância ao epicentro (em km).

- Utilizando a instrução *plot*, desenhe um gráfico da magnitude de um sismo registado no sismógrafo com uma amplitude de 8 mm, em função da distância ao epicentro (avaliada entre os 10 km e os 200 km, em intervalos de 5 km).
- Desenhe um novo gráfico, nas mesmas condições da alínea (a), mas adicionando duas novas séries, correspondentes às amplitudes de 16 e 32 mm. Utilize cores diferentes para representar cada série.
- Complete o gráfico anterior adicionando a legenda, etc.



Student Evaluation Results

UC	Inscritos	1 ^a Insc	Aprov	% Aprov	Dif.	Média
					% Aprov	
ICE	21	0	13	62%	32%	123.8
ICE A	135	76	62	46%	-1%	130.9
ICE B	66	58	55	83%	12%	162.3
ICE B	3	0	2	67%	27%	133.8
ICE B	130	79	106	82%	34%	144.6
ICE C	160	65	70	44%	4%	129.4
ICE D	146	93	98	67%	13%	150.2
ICE E	101	62	66	65%	9%	146.8
ICE E	70	49	55	79%	18%	149.5
ICE E	24	14	16	67%	50%	130.1
	856	496	543	63%	15%	

Routine Visits from Schools



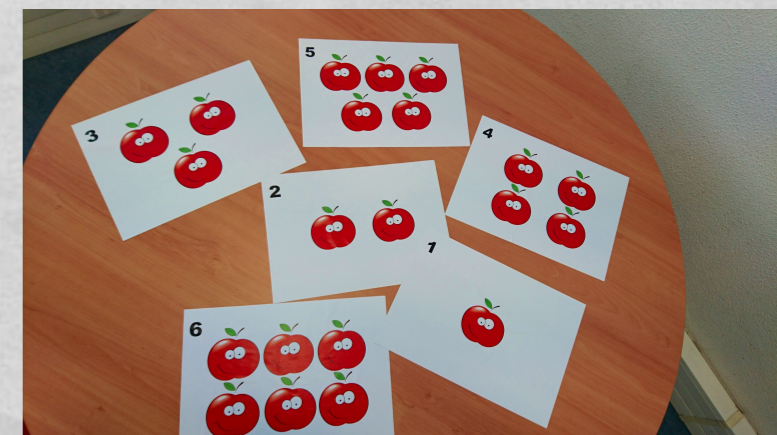
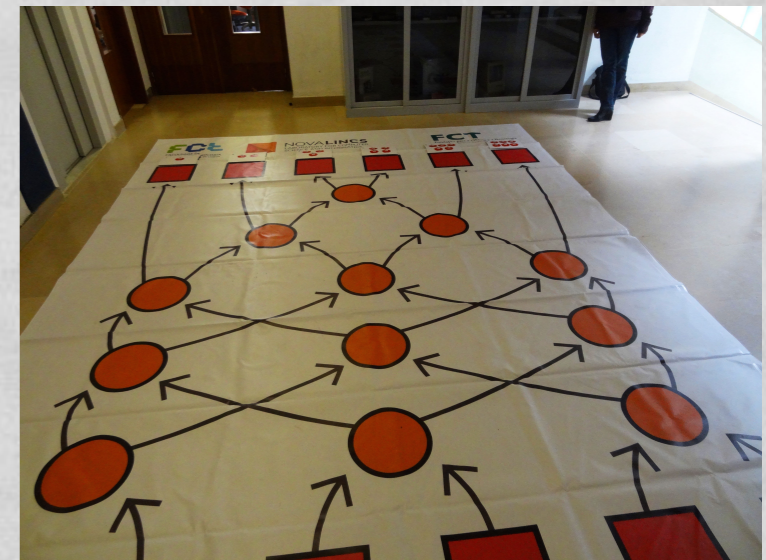
Routine Visits from Schools

- We regularly host visits of classes from secondary schools
- Students come with a couple of teachers for half day
- Typically from 8th to 11th grade
 - Group size ranges from 10 to 40 approximately
- We handle 1 visit per month (sometimes 2)
- Typical Program includes “Computational Thinking” presentation and very simple hands-on activity
 - CODE.ORG type activity, or ..
 - Modify existing code and see what happens

Routine Visits from Schools



Routine Visits from Schools

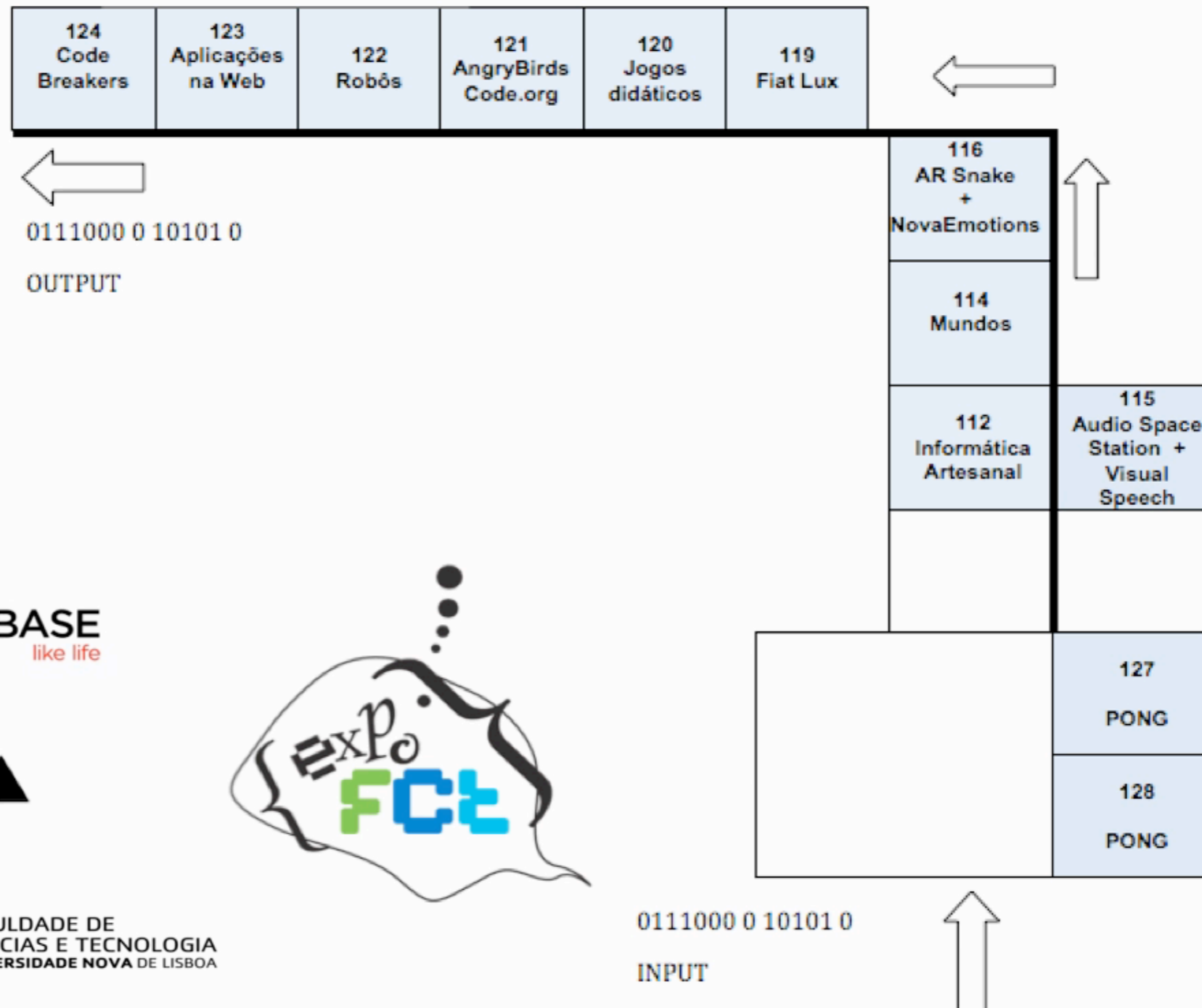


- Teaching a class of children with disabilities about sorting

EXPO FCT DI@FCT UNL

- Open House annually organised by the School
- Students from secondary schools from all over Portugal
- We receive > 1000 students at the Department in one day
- Main Reception activity (PONG Competition)
- Several Booths (10-12 activities)
- Visiting students circulate around freely
- > 20 faculty and > 80 Department students involved

Activity Overview



The Virtual PONG Game



The Virtual PONG Game

DETECTAR



DETECTAR



COMUNICAR, ARMAZENAR



CONTAR



COMPARAR

13 > 2

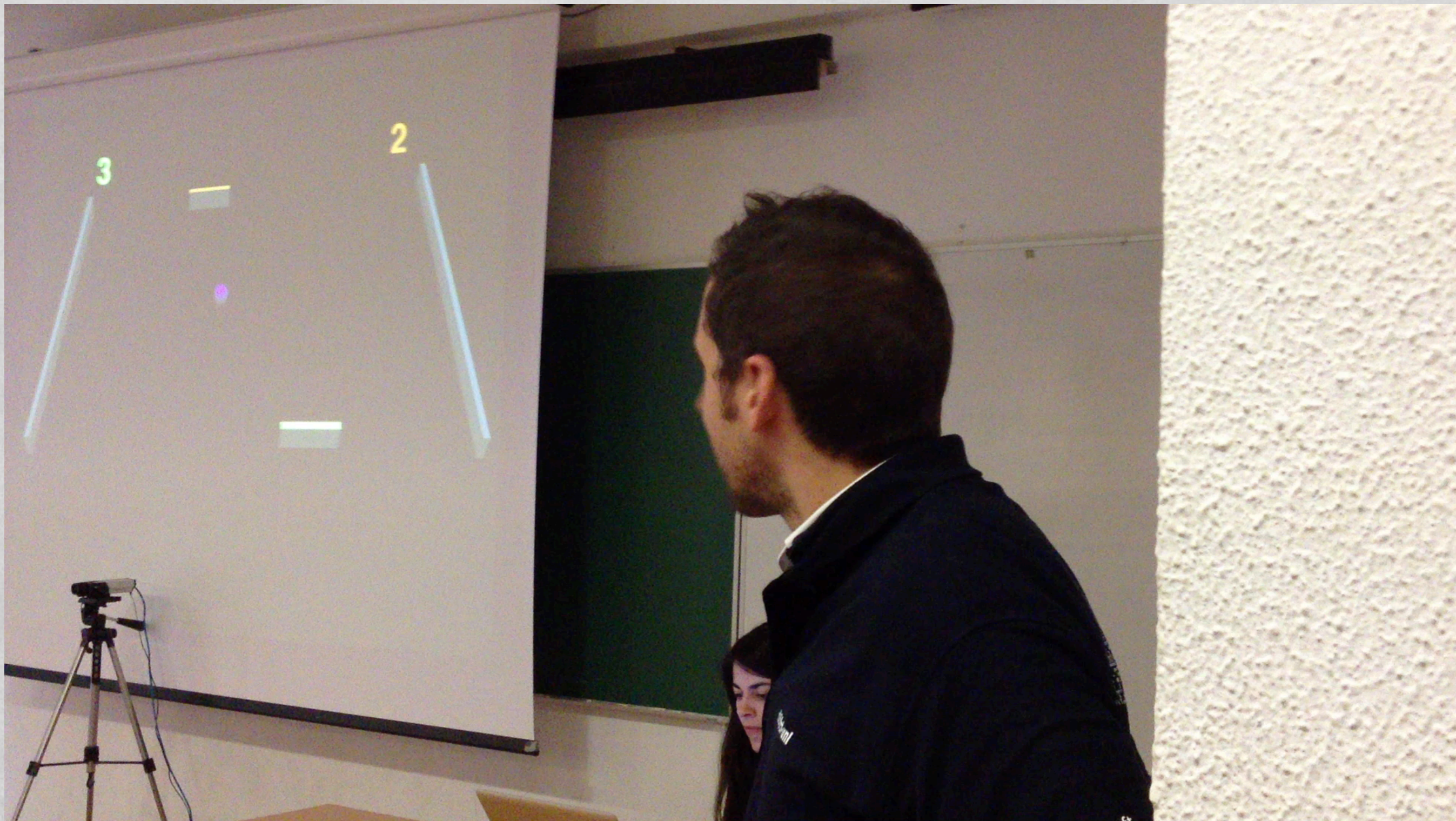


MODELAR, CALCULAR, SIMULAR



```
public void collision(PhysicObject obj1, PhysicObject obj2) {  
    if (obj2 instanceof Sphere) {  
        double vel = Math.abs(obj2.getVelocity().getV(1));  
        vel *= 0.0004;  
        obj2.getVelocity().setV(obj2.getVelocity().getV(1) + 0.7 * -vel, vel);  
  
        double du = ((Box)obj1).getWidth()/2;  
        double du = ((Box)obj2).getWidth()/2;  
  
        if (obj2.getPosition().getX() - (obj1.getPosition().getX() - du) < du) {  
            obj2.getVelocity().setX(obj2.getVelocity().getX() + 0.001);  
        }  
        else if (obj2.getPosition().getX() - (obj1.getPosition().getX() - du) < 2 * du) {  
            obj2.getVelocity().setX(obj2.getVelocity().getX() + 0.002);  
        }  
        else if (obj2.getPosition().getX() - (obj1.getPosition().getX() - du) < 3 * du) {  
            obj2.getVelocity().setX(obj2.getVelocity().getX() + 0.004);  
        }  
        else if (obj2.getPosition().getX() - (obj1.getPosition().getX() - du) < 4 * du) {  
            obj2.getVelocity().setX(obj2.getVelocity().getX() + 0.007);  
        }  
        else if (obj2.getPosition().getX() - (obj1.getPosition().getX() - du) < 5 * du) {  
            obj2.getVelocity().setX(obj2.getVelocity().getX() + 0.001);  
        }  
    }  
}
```

The Virtual PONG Game



The Virtual PONG Game



EXPO FCT DI@FCT UNL 2017

Student Independent Project Exhibition



- Come and imagine the future of the informatics revolution !

EXPO FCT DI@FCT UNL 2017

Student Independent Project Exhibition



EXPO FCT DI@FCT UNL 2017

Student Independent Project Exhibition



EXPO FCT DI@FCT UNL 2017

Student Independent Project Exhibition



Enforcing Students Motivation

Jogo desenvolvido por aluno MIEI no top 3 da AppStore da Apple

04-05-2017



"Tenho 20 anos e desde muito novo que lanço jogos para iPhone, daí ter optado, aos 18 anos vir para a FCT para o MIEI." recorda-nos Pedro Cabaço, estudante de Engenharia Informática na FCT NOVA.

Super Crossbar Challenge, o jogo que concebeu e programou desde o passado mês de Setembro, foi aceite para publicação na AppStore da Apple em todo o mundo, tendo sido referenciado pela empresa como um dos melhores jogos de semana e posto em destaque na página principal em 80 países.



Jogo desenvolvido por aluno MIEI no top 3 da AppStore da Apple

Super Crossbar Challenge, o jogo que concebeu e programou desde o passado mês de Setembro, foi aceite para publicação na AppStore da Apple em todo o...

DI.FCT.UNL.PT

8,970 people reached

Boost Post

Like Comment Share

150

Top Comments

25 Shares

Write a comment...

Departamento de Informática da NOVA <http://p3.publico.pt/.../crossbar-challenge-o-sucesso-de...#>



Crossbar Challenge: o sucesso de uma aplicação portuguesa | P3

Pedro Cabaço tem 20 anos e lançou uma aplicação...

P3.PUBLICO.PT

Like · Reply · Remove Preview · 1 · Commented on by Luís Caires [?] · May 11 at 8:52pm

Eduardo Dias Espetacular! Parabéns Pedro cabaço e DI Departamento de Informática da NOVA!

Like · Reply · Message · 2 · May 4 at 4:43pm

View 2 more comments

- iPhone game developed by students ranks 3 at Apple Store
- News in web site, facebook posts, e-mail appraisal,

Enforcing Students Motivation



The image shows a composite of two screenshots. On the left is a Facebook page for 'P3', featuring a search bar, a profile picture, a 'Gostar da Página' button, and a list of categories including 'Cultura', 'Actualidade', 'Vícios', 'High-Tech', 'Gula', 'Em Trânsito', 'Espelho', 'Ecrã', and 'Fotografia'. Below this is a game advertisement for 'Crossbar Challenge' with the text 'INSPIRED BY REAL LIFE CROSSBAR CHALLENGE' and a score of 3293. On the right is a news article from 'Tecnologia' titled 'Crossbar Challenge: o sucesso de uma aplicação portuguesa'. The article text reads: 'Pedro Cabaço tem 20 anos e lançou uma aplicação que conta com mais de 550 mil downloads. Provavelmente já jogaste Crossbar Challenge, mas sabias que o seu criador é um jovem português?' and is attributed to 'Texto de Ana Rita Carvalho • 10/05/2017 - 15:32'.

- iPhone game developed by students ranks 3 at Apple Store
- Attracting attention from the press (“Público”)

Enforcing Students Motivation

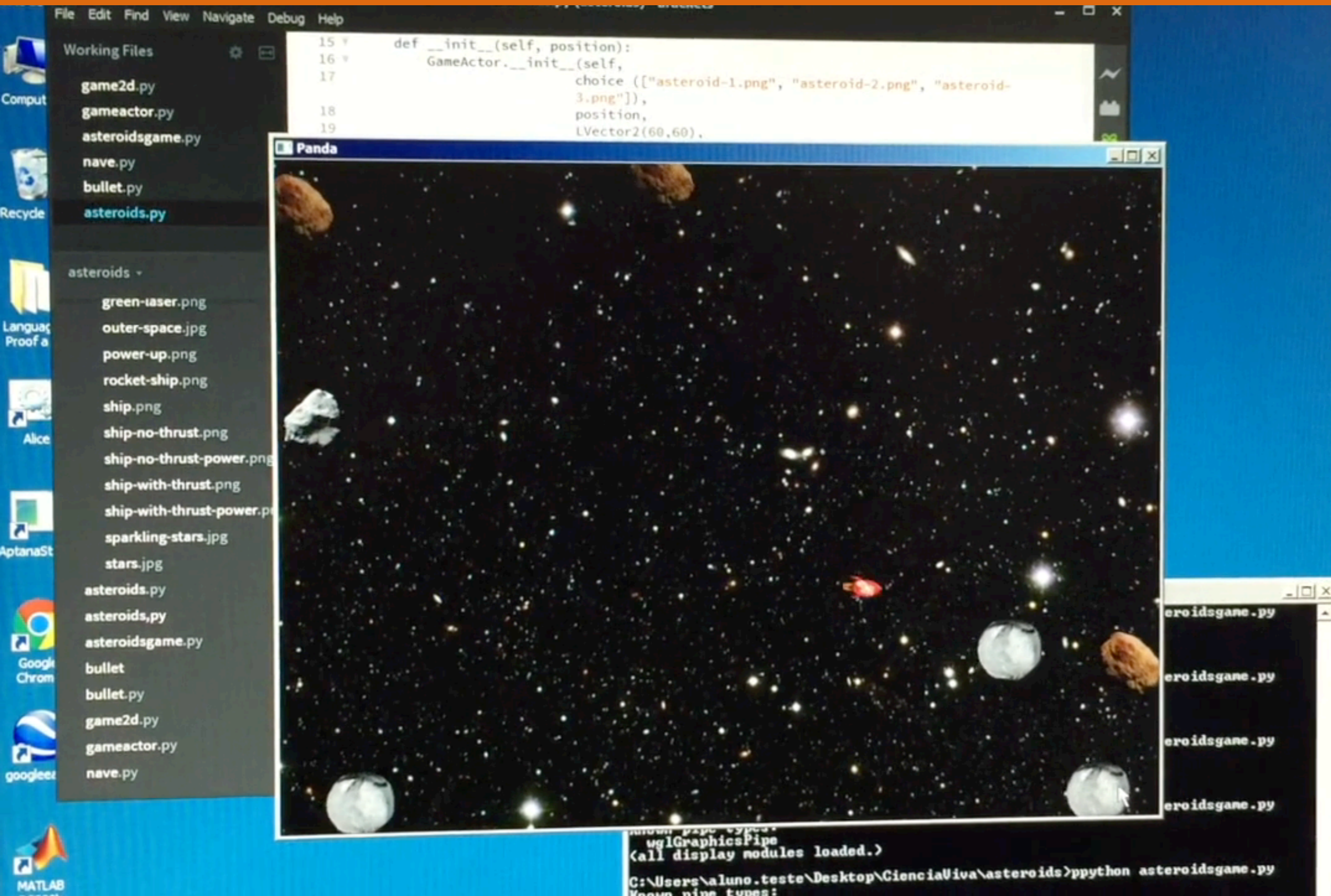


- iPhone game developed by students ranks 3 at Apple Store
- Presentation by co-author at CS Freshmen Welcome 2017

Summer 1-3 day courses

- Co-promoted with national initiative “Ciência Viva”
- Typically from 8th to 11th grad (Group size 20-25)
- Typical Program includes “Computational Thinking” and small programming course
 - Basic concepts of OO programming
 - Basic concepts of modelling
 - Develop a Arcade Game in Python
- We handle 2 editions year
- Very successful to attract good students

Summer 1-3 day courses



Distinguished Lecture Series

DLFCT.NOVA
NOVA LINC
DISTINGUISHED LECTURE 2017

14h30, October 11th, 2017
Main Auditorium FCT NOVA

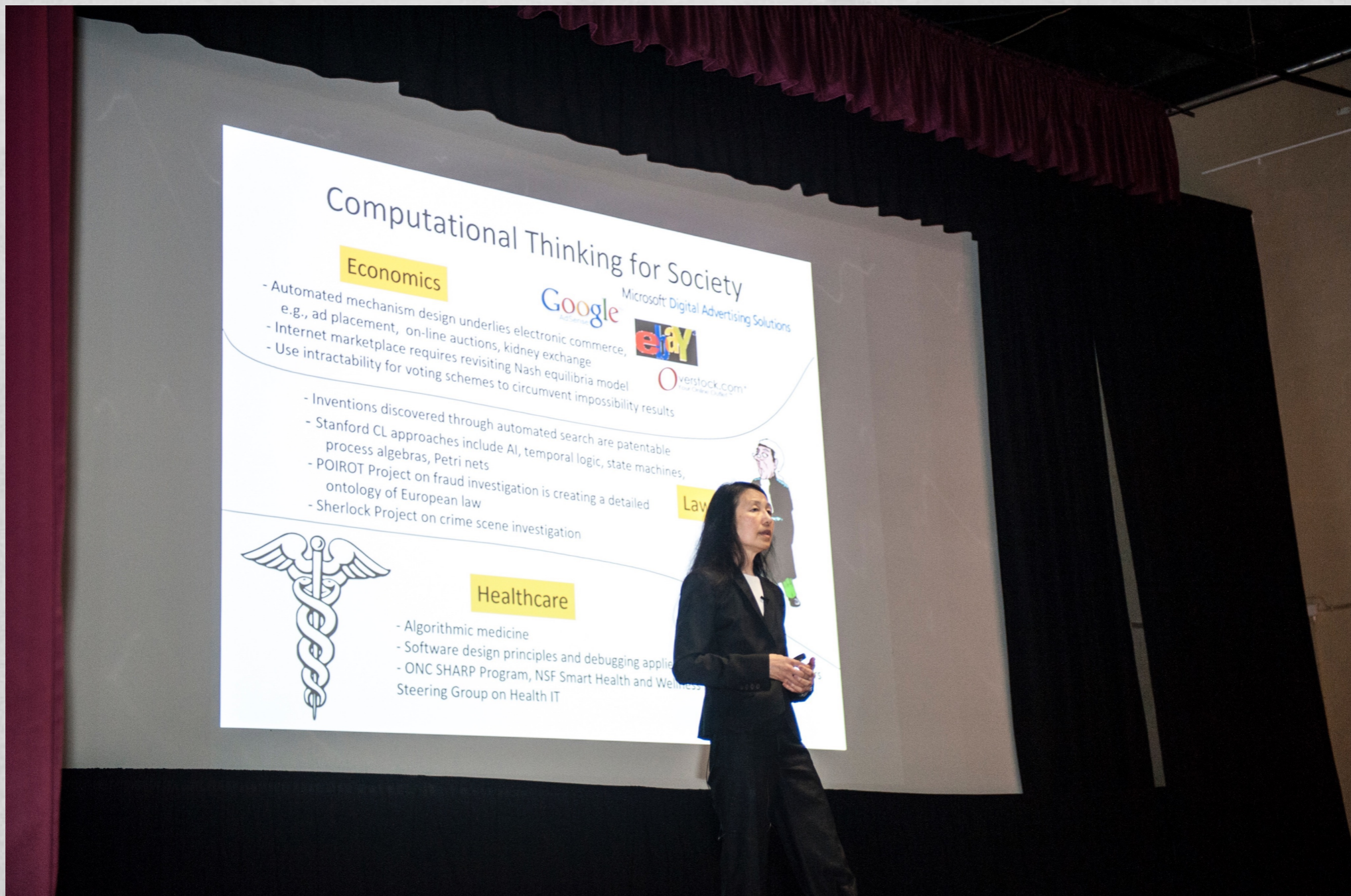
Data Science for Mobility

Pascal Van Hentenryck,
University of Michigan



NOVALINCS
LABORATORY FOR COMPUTER

Distinguished Lecture Series



- Liskov (12), Henzinger (13), Lamport (14), Wing (15), Cardelli (16)

Distinguished Lecture Series

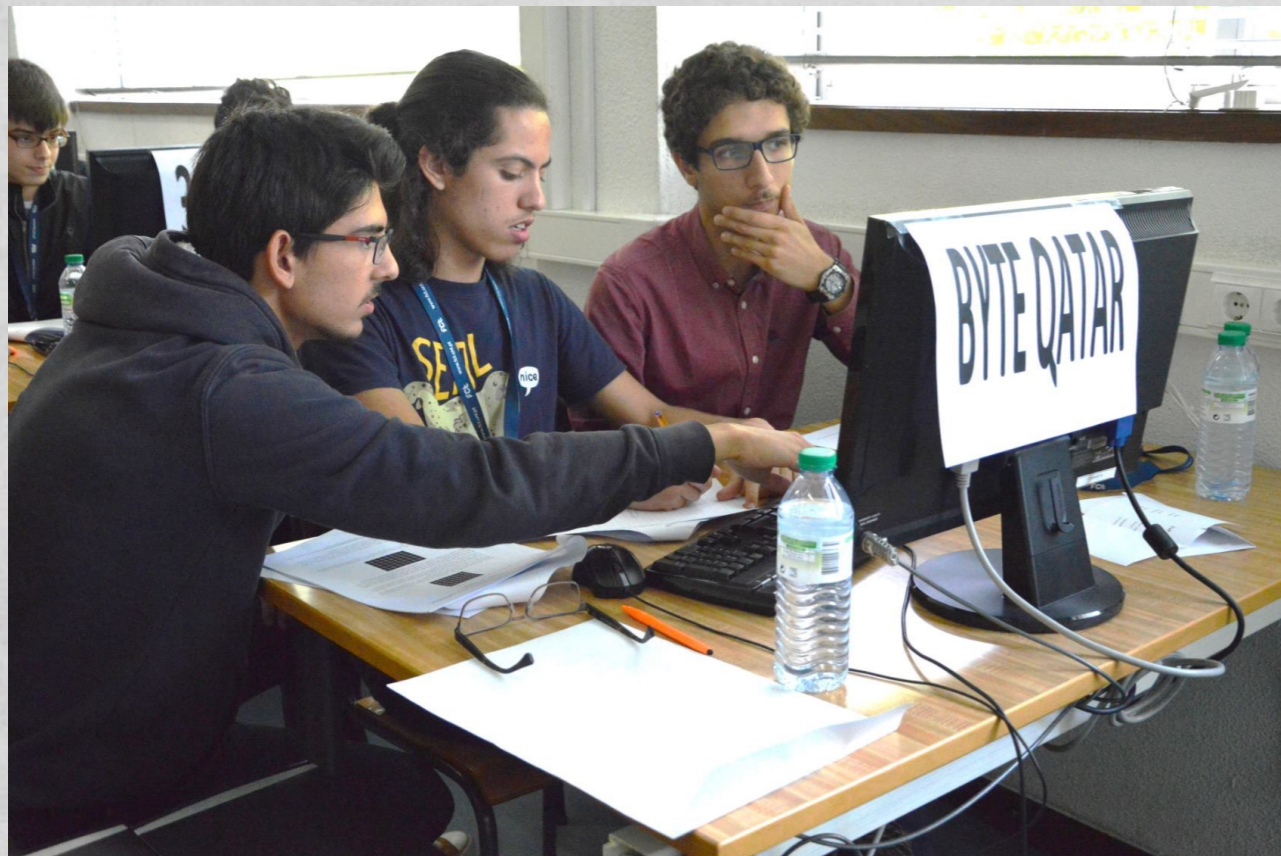


- > 450 attendance (students, faculty, partner representatives)

Programming Contests



Programming Contests



- We organize two annual programming competitions for secondary school students (in around 10-15 teams)
- TOPAS LX (in collaboration with local schools)
- MIUP (used as national selection for SWERC)
- More than 50 undergrad students involved in the organisation

CODE.MOVE 2016



- National event organised in partnership with Ministry of Education, Ministry of Science and Higher Education, and “Ciência Viva”
- Mobilised more than 1100 secondary schools nationwide
- Based on specially developed cloud based “hour of code” platform developed by a joint faculty + students
- Intense press (printed and TV) coverage

Girls in ICT 2017



- Special event to increase awareness of girls towards informatics and computer science
- Special hands-on event Ms Pacman (customize game)
- Plenary Session with alumnae and faculty (many generations)

Girls in ICT 2017

Teresa
Romão

Madalena
Quirino

Célia Reis

Carmo
Palma

Marlene
Vitorino

Laetitia
Mendes

Ana
Simão

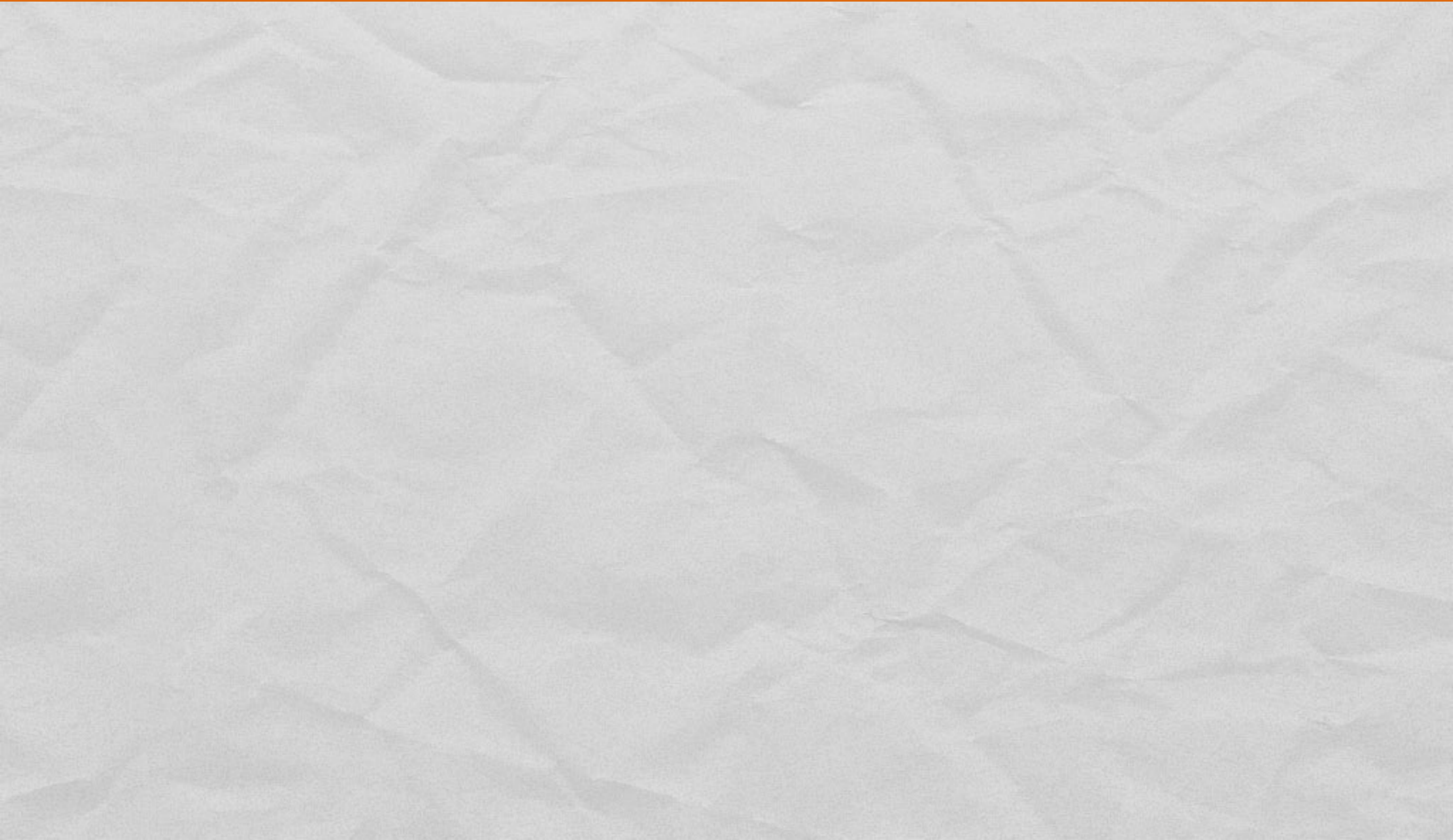
Perspetivas sobre a Profissão em Engenharia Informática

FCT FACULDADE DE
CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

NOVALINCS
LABORATORY FOR COMPUTER
SCIENCE AND INFORMATICS



Sample Research Outreach



Sample Research Outreach



- Exhibition “Sem Rede” Joana Vasconcelos (Advanced HCI)

Sample Research Outreach



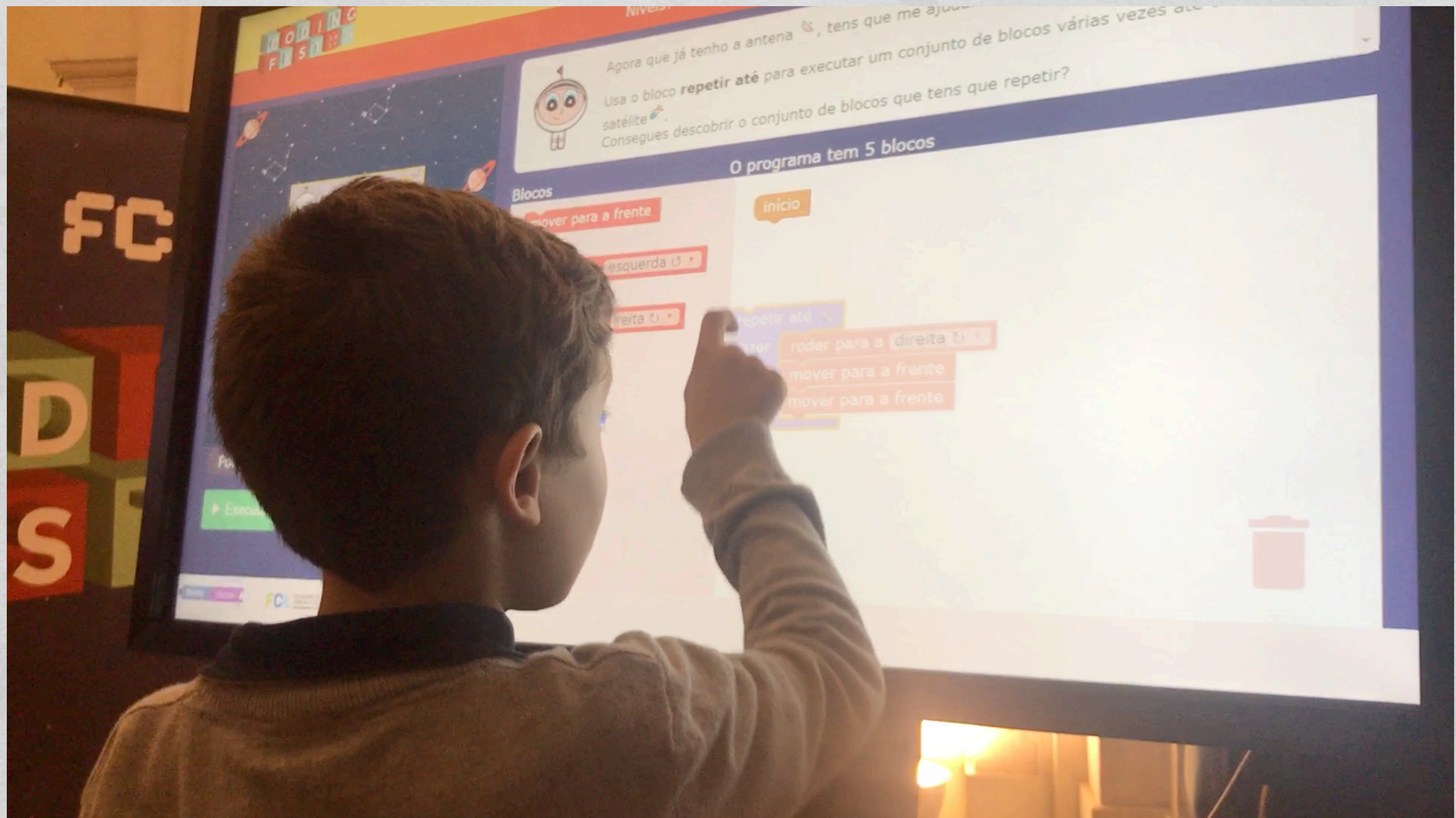
- ICT related exhibitions (Software Development Tools)

Sample Research Outreach



- Researchers' Night 2016 (Gamification for Speech Therapy)

Sample Research Outreach



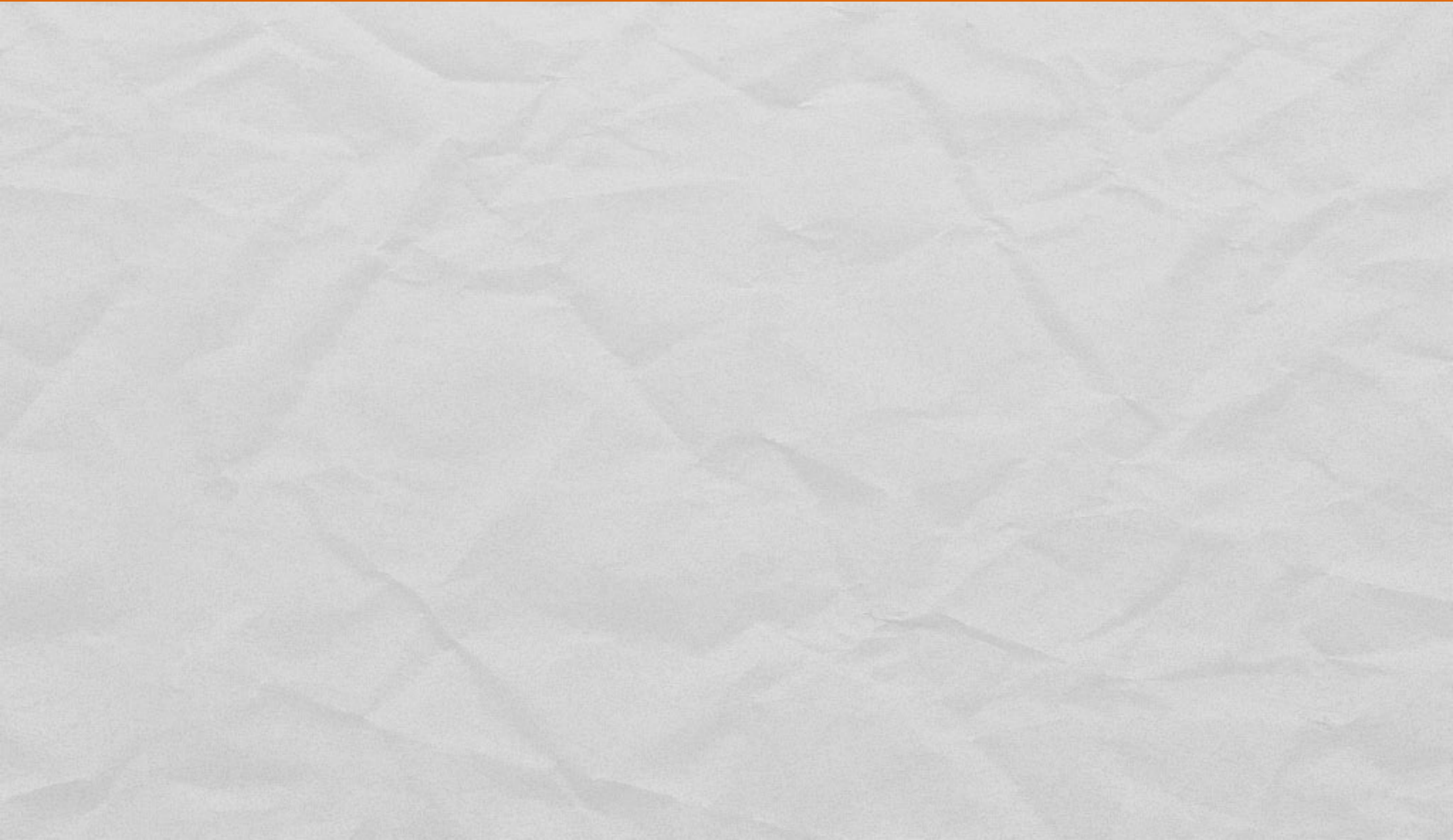
- Researchers' Night 2017 (Cyberphysical Systems)

Sample Research Outreach



- Researchers' Night 2017 (Cyberphysical Systems)

Students' Promoted Activities



Students' Promoted Activities

- Students always called to participate in Department Activities
 - In close contact with the Department Exec Committee
 - Active coaching by Department Faculty
 - Excellent personal relationship between students and faculty
- Several leading groups:
 - PhD Students (NovaStudentTalks)
 - Undergraduates “Núcleo de Informática” (NINF)
 - These strongly network with students of other programs

Hackathon (NINF)



- Annual event organised by undergraduate students
- 24 hour App-Dev Hackathon (attracts many outside studs)
- Awards supported by partner companies

JORTEC (NINF)

JORTEC
Informática

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✉ f t

A NEW REALITY

Jornadas Tecnológicas de Informática FCT NOVA 2017

7 & 8 of February 2017
FCT NOVA (Campus de Caparica)

- Annual event organised by undergrads, school-wide

JORTEC (NINF)



- Annual event organised by undergrads, school-wide
- Technical Talks, Workshops, Panels, Networking, Job-shop

NovaStudentTalks



- Organised by PhD and MSc students, open to all school
- Technical Talks about “hot topics”, “tools”, “products”

Annual PhD Program Workshop



- Organised by PhD studs + faculty , attended by MSc students
- Presentations by PhD students in various stages of work
- Invited Keynote (international guest)

Wrapping Up

- “Informatics for all!” benefits from integration of efforts
 - Research + Education
 - Relationship with external partners (companies, schools, ...)
- And integration of roles, skills, and motivations
 - Set up a core team (outreach committee - 5 people)
 - Involve all faculty, adopt reasonable incentives & appraisal
 - Involve students and students' associations
 - Support bottom-up initiatives under a shared vision
- Important to strengthen image of CS and Informatics within the campus, and outside among the general public