


10th Int. Workshop in Math e-Learning (e-math 2018)
Lisbon, October 15-16, 2018

Teaching Computer Simulation and Optimization Online to Students with Different Backgrounds

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Overview

- Part I: ICSO@IN3 - Barcelona
- Part II: Math & Analytics for a Smarter World
- Part III: e-Math Courses become Global
- Part IV: New Challenges & Strategies
- Part V: Erasmus+ Network on Math e-Learning
- Part VI: Conclusions & More

mathematics

Part I:

ICSO@IN3 - Barcelona

(2017 SGR 111 Consolidated RG)

Barcelona: City of Knowledge

6+ inter-connected universities promoting interdisciplinary and international research

Universitat de Barcelona

Euncet Business School

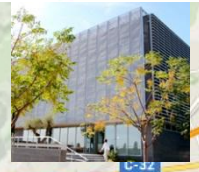
UAB Universitat Autònoma de Barcelona

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

UOC Universitat Oberta de Catalunya

upf. Universitat Pompeu Fabra Barcelona

Introducing the IN3 @ Barcelona (1/2)



Introducing the IN3 @ Barcelona (2/2)

- Internet Interdisciplinary Institute
- Mediterranean Technology Park

INFORMATION AND NETWORK TECHNOLOGIES

SOCIAL TRANSFORMATIONS

eHEALTH

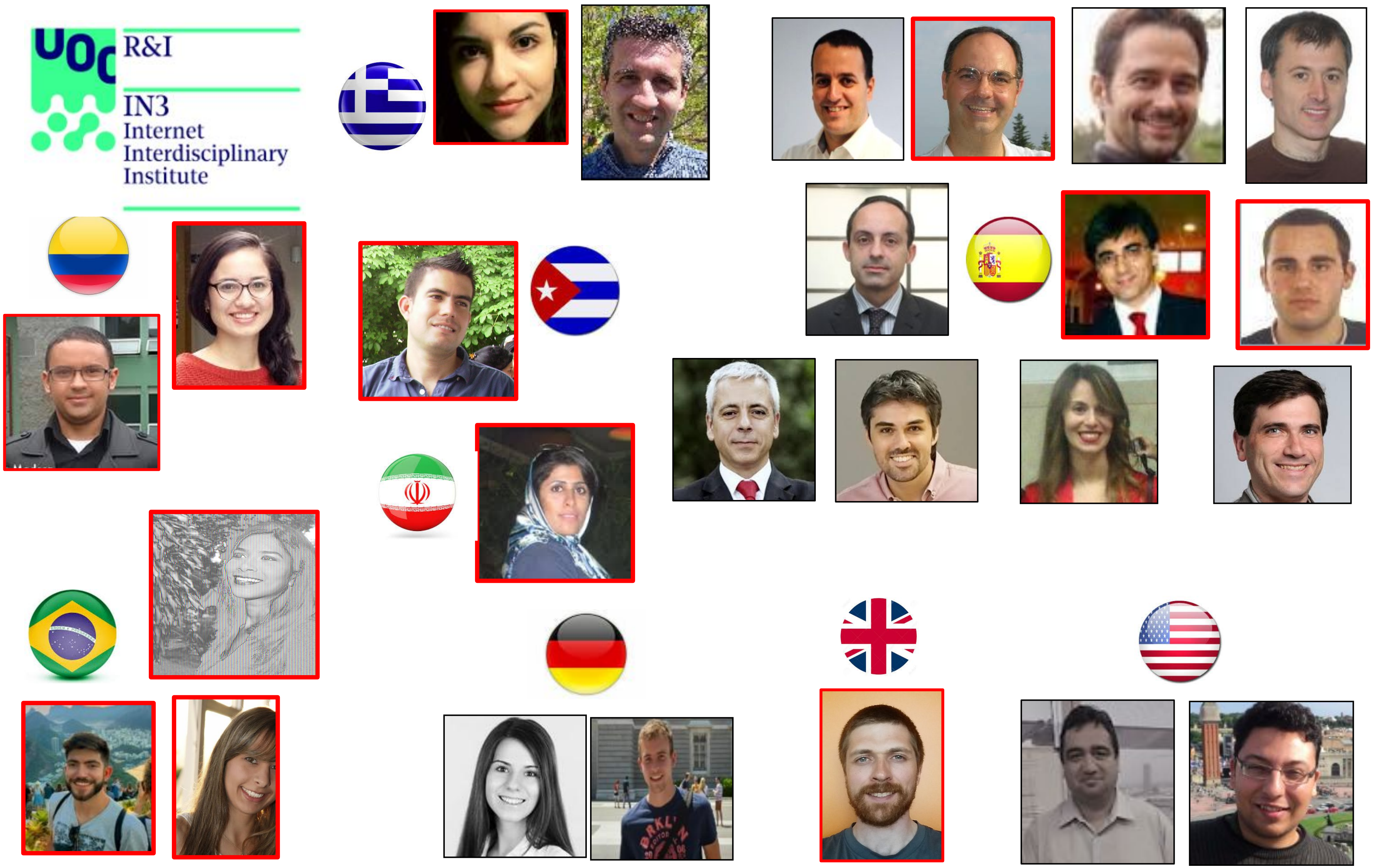
INSTITUTIONAL CHANGES

DIGITAL CULTURE

OSRT

UOC R&I
IN3
Internet
Interdisciplinary
Institute

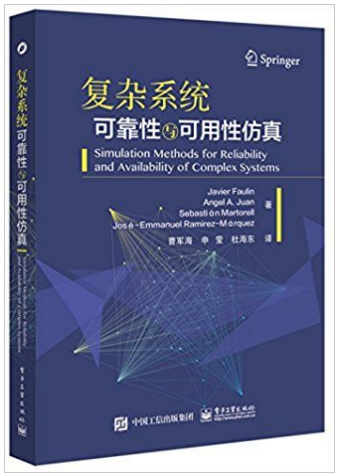
Introducing ICSO @ IN3 (1/3)

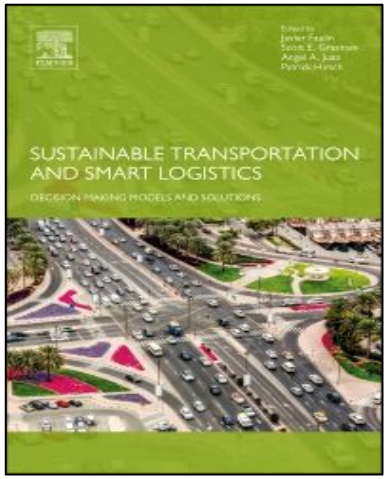


Introducing ICSO @ IN3 (2/3)

BRAs, Simheuristics, Learnheursitics

Introducing ICSO @ IN3 (3/3)





ICSO@IN3 Training in MSc & PhD Programs

Universitat Oberta de Catalunya

PhD Network & ITs

Universitat Rovira i Virgili

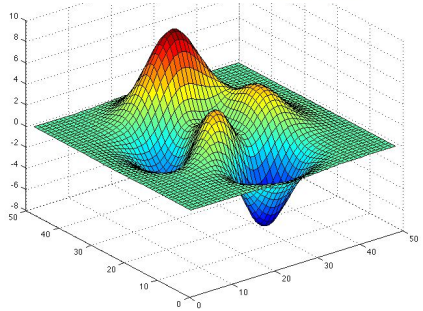
MSc Computational Engineering & Maths

MSc Informatics & MSc Data Science

Euncet Business School

MSc Business Administration

UNIVERSIDADE ABERTA www.uab.pt 30 ANOS



PhD Applied Math & Modeling

UAB Universitat Autònoma de Barcelona

MSc Logistics & SCM

MSc Aeronautical Management

Industrial Partners & Industrial Doctorates

INSYLO
SMART FARMING REVOLUTION
DOCTORATS INDUSTRIALS

accenture
DOCTORATS INDUSTRIALS

RHENUS LOGISTICS
DOCTORATS INDUSTRIALS

Euncet Business School
DOCTORATS INDUSTRIALS

OPTRAK
VEHICLE ROUTING SOFTWARE

WORLD SENSING

SMATSA
serveis medi ambient s.a.

GUY CARPENTER

OPEIN

ACTOR
Analytics Control Technology
OPERATIONS RESEARCH

CERTIFICACIÓN DE PROYECTOS
DNV·GL
I+D+i

Smart Monkey

DUNAV NET

divinapastora seguros

vueling

International Academic Partners

University of CINCINNATI

Georgia Tech

ROCHESTER INSTITUTE OF TECHNOLOGY R·I·T 1829

Massachusetts Institute of Technology

PROGRAMA IBEROAMERICANO CYTED CIENCIA Y TECNOLOGÍA PARA EL DESARROLLO

UFMG UNIVERSIDADE FEDERAL DE MINAS GERAIS

UFOP

Universidade de Brasília

Pontificia Universidad JAVERIANA Bogotá

Universidad de La Sabana

UNL Universidad Nacional del Litoral

Erasmus+

technische universität dortmund

University of Natural Resources and Life Sciences, Vienna

Trinity College Dublin The University of Dublin

LAAS-CNRS

SAPIENZA UNIVERSITÀ DI ROMA

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

AbERTA 30 ANOS www.uab.pt

U.PORTO

UNIVERSIDADE NOVA DE LISBOA

AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

University of Portsmouth

UNIVERSITY OF Southampton

Amsterdam University of Applied Sciences

Part II:

Math & Analytics for a Smarter World

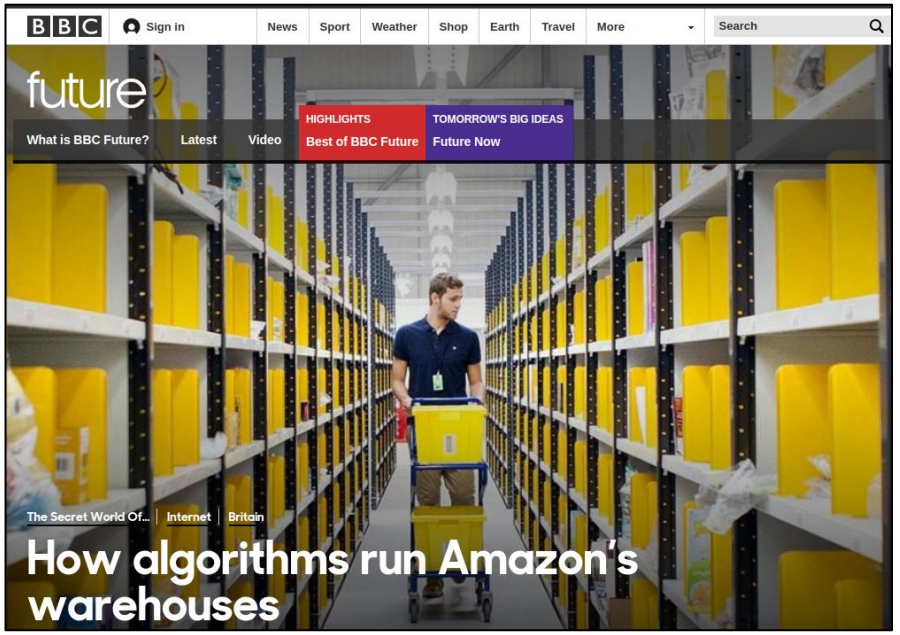
The world around us is becoming increasingly complex: globalization, freight and people mobility, IoT, e-commerce, sustainability issues, ...

Can we work for a better and more sustainable world? *(wiser world)*

How can we support decision making in a complex world?

Big Data Analytics

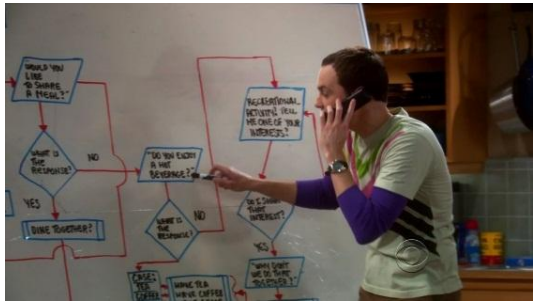
Data analytics




```
if i ≥ maxval then
    i ← 0
else
    if i + k ≤ maxval then
        i ← i + k
    end if
end if
```

Algorithms (Solving & Searching Methods)

Analytics: describe, predict, and prescribe



- **Descriptive Analytics (DA)** → processing historical data to describe the real context.

Data analytics

- **Predictive Analytics (PdA)** → forecast the future with time series analysis, regression models, and machine learning methods.

MACHINE LEARNING

- Anything else? Can't we go smarter?

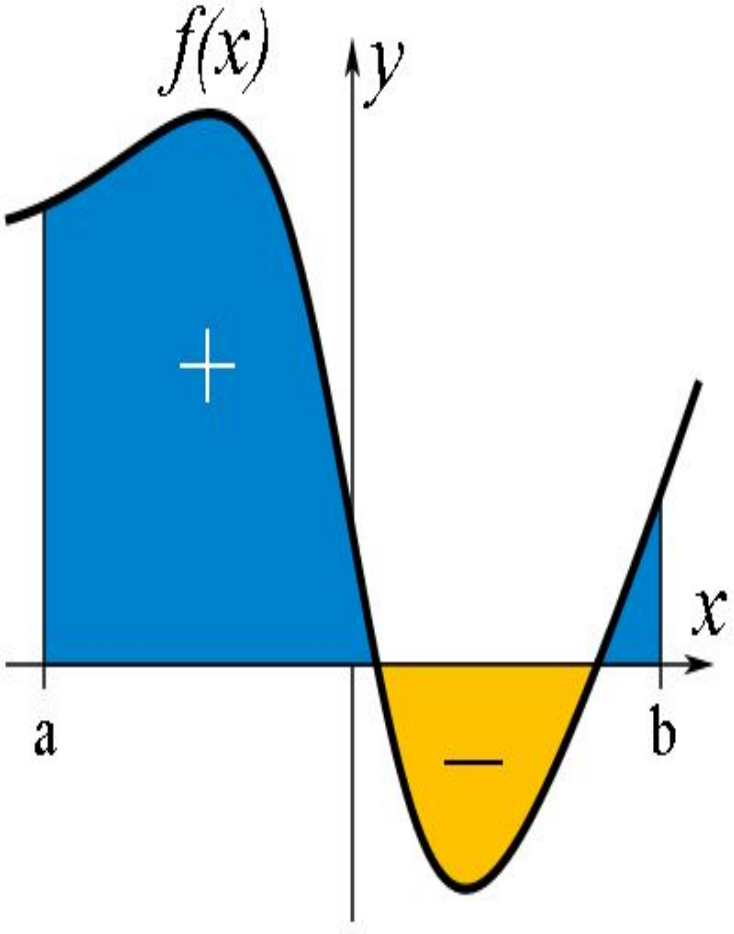
- **Prescriptive Analytics (PsA)** → complex decision-making (optimization-simulation algorithms)

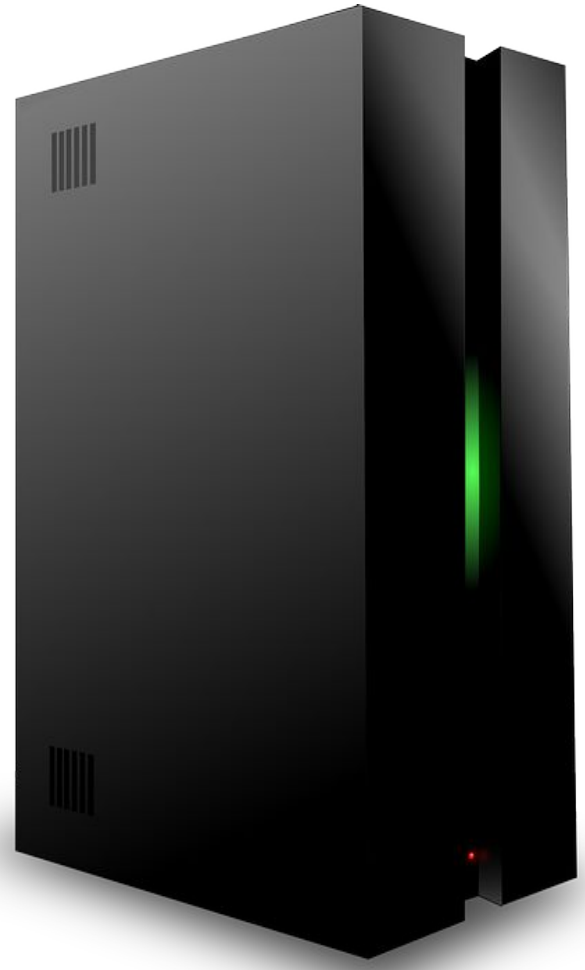
Optimization

METAHEURISTICS

SIMULATION

Different types of Optimization Algorithms





Exact Methods (lab problems?)

(Meta-) heuristics (real-life problems?)

Matheuristics (real-life problems?)

Yes, but… something is missing…

Real life is plenty of uncertainty!

What if we merge (Meta-) Heuristics with Simulation?

METAHEURISTICS

SIMULATION

```
if i ≥ maxval then
   i ← 0
else
   if i + k ≤ maxval then
      i ← i + k
   end if
end if
```

+

=

Simheuristics: a smart tool for a complex world

We are also working on a new concept...

Learnheurisitcs for dynamic problem settings

What if we merge (Meta-) Heuristics with Machine Learning?

METAHEURISTICS

```
if i ≥ maxval then
   i ← 0
else
   if i + k ≤ maxval then
      i ← i + k
   end if
end if
```

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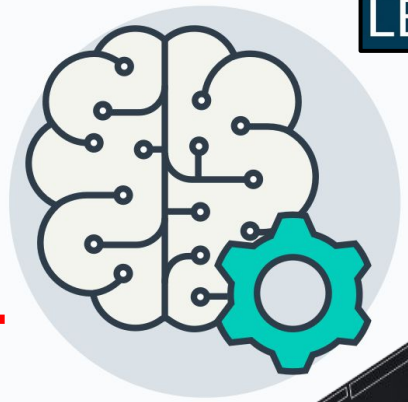
MACHINE LEARNING



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Learnheuristics: a smart tool for a complex and dynamic world

OR/Analytics solve Complex Problems for Business

Optimization

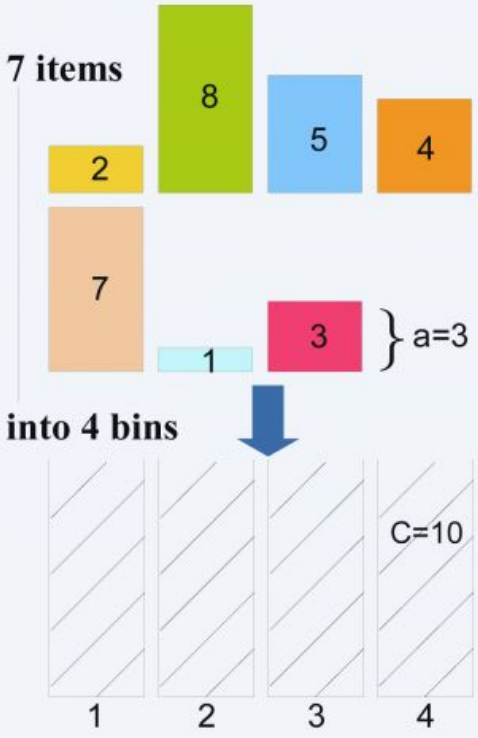
METAHEURISTICS

MACHINE LEARNING

SIMULATION

Problem → Model → Method → Solution

Pack m items into n bins.



Formulate the problem as mathematical model

Use minimal number of bins

$$\min \sum_{j=1}^{n} y_j$$

Put each item in exactly one bin

$$\sum_{j=1}^{n} x_{i,j} = 1 \quad \forall i \in 1 \dots m$$

Observe bin's capacity

$$\sum_{i=1}^{m} a_i x_{i,j} \leq C y_j \quad \forall j \in 1 \dots n$$

$$x_{i,j} = \begin{cases} 1 & \text{item } i \text{ is in bin } j \\ 0 & \text{otherwise} \end{cases}$$

$$y_j = \begin{cases} 1 & \text{bin } j \text{ is used} \\ 0 & \text{otherwise} \end{cases}$$

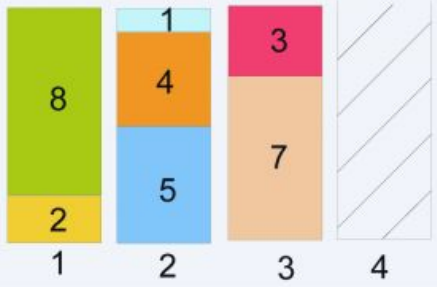
Place each item after the other into the first free bin.

$j = 1$
$y_j = 1$
$r_j = C$
for each item i
  flag = true
  for $k = 1$ to j
    if $a_i \leq r_j$ then
      $r_j = r_j - a_i$
      $x_{i,j} = 1$
      flag = false
  if flag **then**
    $j = j + 1$
    $y_j = 1$
    $r_j = C - a_i$
    $x_{i,j} = 1$

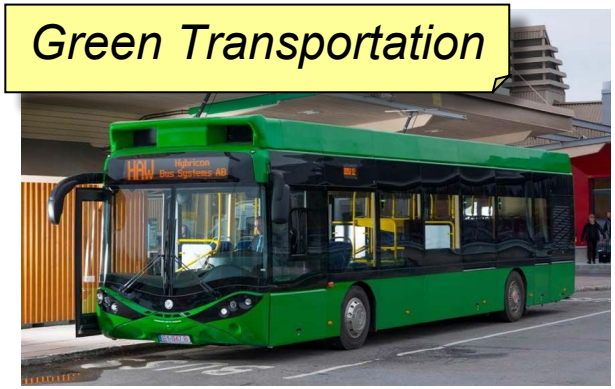
3 bins are needed only to pack all 7 items.

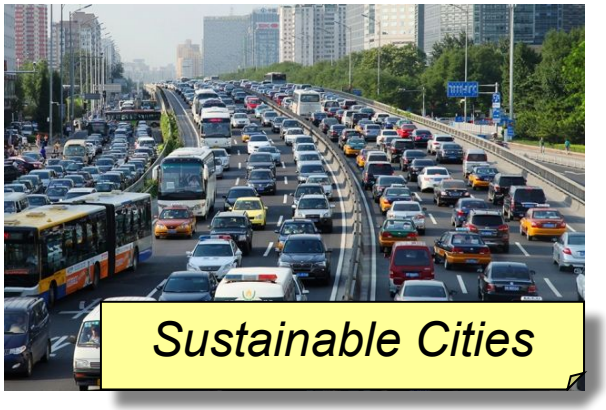
$$x_{i,j} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

$$y_j = (1 \ 1 \ 1 \ 0)$$



Main applications areas





Optimizing airline crew scheduling

Social Responsible Crew Rostering

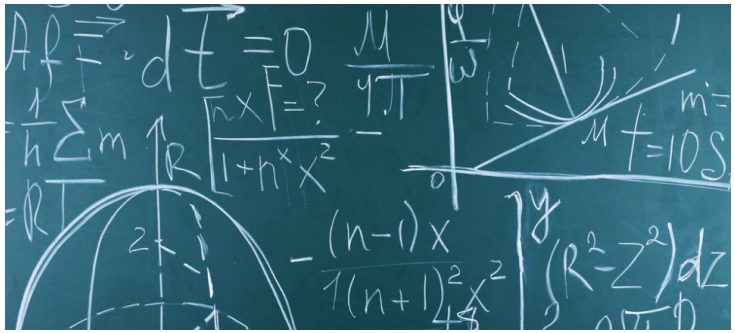
	August																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Hours	Avg Hours
Crew Member 1	OFF	OFF	OFF	OFF	M1	M1	M1	F	F	OFF	OFF	OFF	M1	M1	M1	M1	M1	OFF	OFF	OFF	OFF	M1	M1	T1	T1	T2	OFF	OFF	OFF	SBY	F	80h 6m	2h 35m
Crew Member 2	OFF	OFF	OFF	M1	M2	M2	T1	T1	OFF	OFF	OFF	F	M2	T1	T1	T1	OFF	OFF	OFF	OFF	M4	M2	M2	M1	M1	OFF	OFF	OFF	SBY	T1	T1	78h 58m	2h 33m
Crew Member 3	OFF	OFF	M1	M2	SBY	T1	T2	OFF	OFF	OFF	F	F	SBY	T2	T2	OFF	OFF	OFF	OFF	M1	M1	M3	M3	M2	OFF	OFF	OFF	F	F	M4	T2	80h 37m	2h 36m
Crew Member 4	OFF	M1	M2	M3	F	T2	OFF	OFF	OFF	M1	M1	M2	T1	T3	OFF	OFF	OFF	OFF	SBY	T1	T1	T1	T1	OFF	OFF	OFF	T1	T1	F	F	F	74h 42m	2h 24m
Crew Member 5	OFF	OFF	OFF	M4	M3	SBY	T3	T2	OFF	OFF	OFF	OFF	F	M2	M2	T2	T1	OFF	OFF	OFF	M3	M4	SBY	T2	F	OFF	OFF	OFF	OFF	M1	M1	79h 3m	2h 33m
Crew Member 6	OFF	OFF	T1	T1	T1	T3	T4	OFF	OFF	OFF	OFF	M1	M3	M3	SBY	T3	OFF	OFF	OFF	M2	M2	SBY	T2	T3	OFF	OFF	OFF	OFF	M1	M2	T3	79h 1m	2h 33m
Crew Member 7	OFF	M2	M3	SBY	T2	T4	OFF	OFF	OFF	OFF	F	F	T2	T4	T3	OFF	OFF	OFF	M4	M4	SBY	F	F	OFF	OFF	OFF	OFF	M1	M2	M3	M3	77h 2m	2h 29m
Crew Member 8	M1	M3	SBY	T2	T3	OFF	OFF	OFF	OFF	M2	M2	M3	M4	F	OFF	OFF	OFF	F	F	SBY	T2	T2	OFF	OFF	OFF	OFF	M1	M2	M3	F	F	74h 46m	2h 24m
Crew Member 9	F	T1	F	T3	OFF	OFF	OFF	OFF	M1	M3	M3	SBY	T3	OFF	OFF	OFF	M2	M1	M2	M3	F	OFF	OFF	OFF	OFF	SBY	T2	T2	T1	T2	OFF	75h 27m	2h 26m
Crew Member 10	M2	SBY	T3	OFF	OFF	OFF	OFF	M1	M2	SBY	T1	T1	OFF	OFF	OFF	SBY	T2	T1	T1	T2	OFF	OFF	OFF	OFF	M2	M1	M2	T4	T3	OFF	OFF	78h 18m	2h 31m
Crew Member 11	T1	OFF	OFF	OFF	OFF	VAC	VAC	VAC	VAC	VAC	OFF	OFF	OFF	SBY	T4	T4	T3	T2	OFF	OFF	OFF	OFF	T3	T4	T2	T1	T3	OFF	OFF	OFF	M2	61h 16m	2h 21m
Crew Member 12	M3	F	T4	T4	T4	OFF	OFF	OFF	M3	F	M4	M4	F	OFF	OFF	OFF	OFF	M2	M3	F	F	T3	OFF	OFF	OFF	M2	SBY	T3	T2	T3	OFF	77h 54m	2h 30m
Crew Member 13	M4	M4	M4	F	OFF	OFF	OFF	SBY	T1	T2	T2	T2	OFF	OFF	OFF	OFF	M3	M3	M1	F	F	OFF	OFF	OFF	SBY	F	T4	F	F	OFF	OFF	74h 23m	2h 24m
Crew Member 14	T2	T2	F	OFF	OFF	OFF	M2	M2	T2	T3	T3	OFF	OFF	OFF	OFF	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	OFF	41h 30m	2h 35m
Crew Member 15	T3	OFF	OFF	OFF	M4	M3	SBY	T3	T3	OFF	OFF	OFF	OFF	M4	M3	M2	M4	M4	OFF	OFF	OFF	F	M4	M3	T3	T3	OFF	OFF	OFF	OFF	SBY	80h 46m	2h 36m
Crew Member 16	SBY	T3	T2	F	F	OFF	OFF	OFF	M4	M4	SBY	T3	T4	OFF	OFF	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	OFF	39h 54m	2h 29m
Crew Member 17	T4	T4	F	F	OFF	OFF	OFF	T4	T4	T1	F	T4	OFF	OFF	OFF	OFF	SBY	T3	T2	T3	T3	OFF	OFF	OFF	M3	M3	M3	M3	M4	OFF	OFF	82h 14m	2h 39m
Crew Member 18	F	F	F	OFF	OFF	OFF	M3	M3	SBY	T4	T4	OFF	OFF	OFF	OFF	M3	F	SBY	T3	T4	OFF	OFF	OFF	M4	M4	M4	M4	M4	OFF	OFF	OFF	77h 25m	2h 30m
Crew Member 19	F	OFF	OFF	OFF	F	M4	M4	M4	F	OFF	OFF	OFF	OFF	F	M4	M4	T4	T4	OFF	OFF	OFF	F	F	SBY	T4	T4	OFF	OFF	OFF	OFF	M4	74h 58m	2h 25m
Crew Member 20	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	VAC	OFF	OFF	OFF	T4	F	T4	T4	T4	OFF	OFF	OFF	OFF	SBY	T4	T4	T4	43h 52m	2h 44m
																																1432h 12m	

JDe Armas, J.; Cadarso, L.; Juan, A.; Faulin, J. (2016): **"A multi-start randomized heuristic for real-life crew rostering problems in airlines with work-balancing goals"**. Annals of Operations Research, 258(2), 825-848

Part III:

e-Math Courses become Global

Math Higher Education in the Internet Age



LOCAL

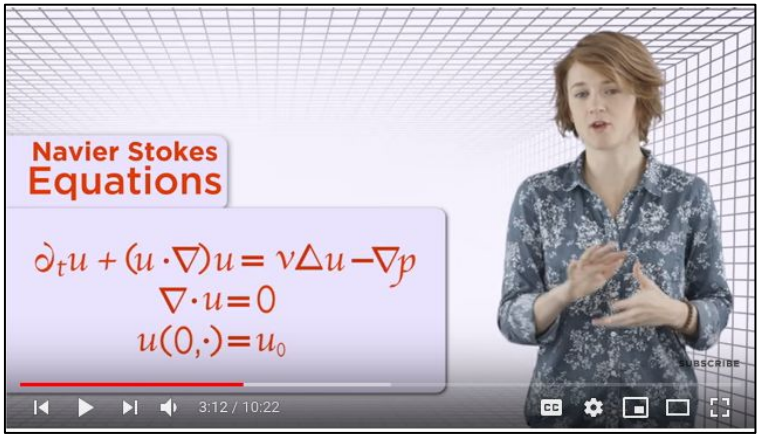
FORTRAN 77

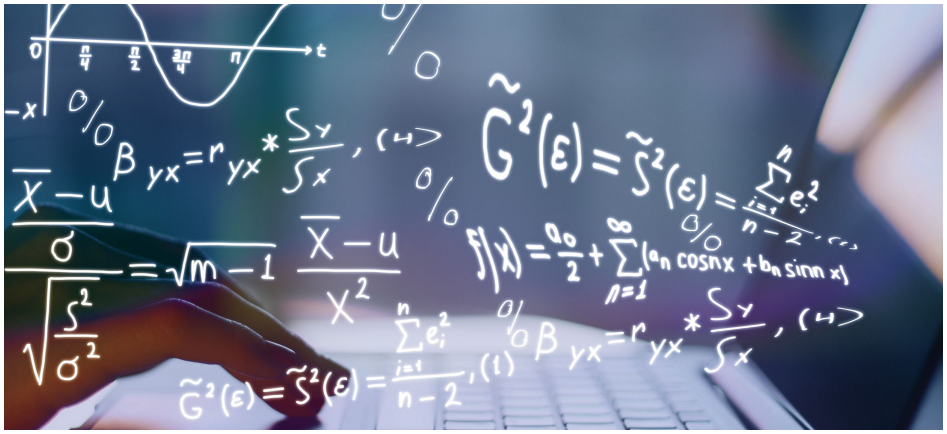
python™

MATLAB

Wolfram Mathematica

R





Main Online Universities in Europe

UNED

The Open University

EADTU

EADTU - European Association of Distance Teaching Universities

Traditional Universities Go Online and Global!

UAB Universitat Autònoma de Barcelona

Universitat de Barcelona

UPC Universitat Politècnica de Catalunya BarcelonaTech

ONLINESTUDIES.COM
Trusted by Students since 2002

University of Liverpool

King's College London

University of Glasgow

Stockholm University

University of Salford Manchester

Trinity College Dublin
The University of Dublin

Fraunhofer

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Affordable • Accessible • Quality

Stanford University

Georgia Tech

UMASS University of Massachusetts Lowell

Purdue University

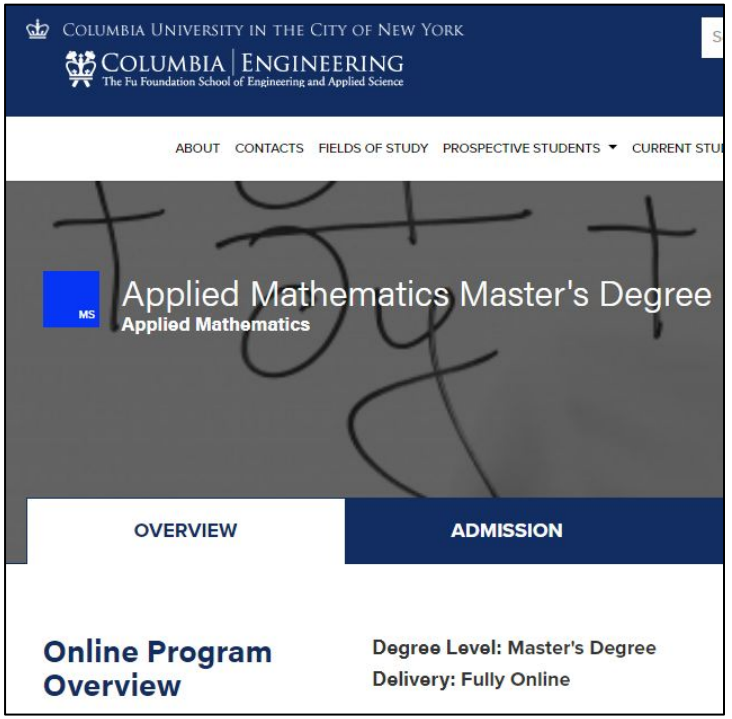
Berkeley
University of California

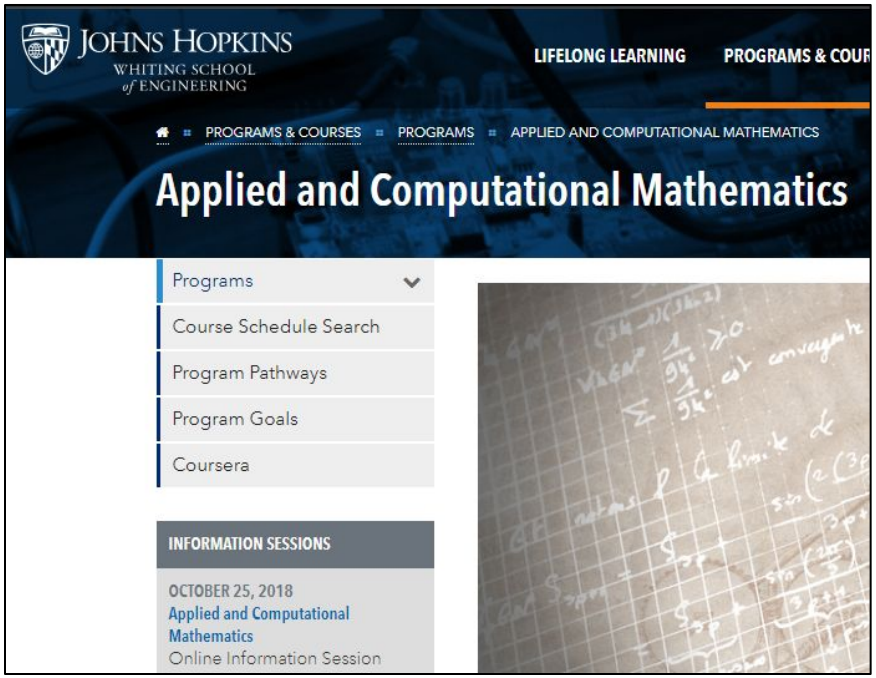
The George Washington University
Washington, DC

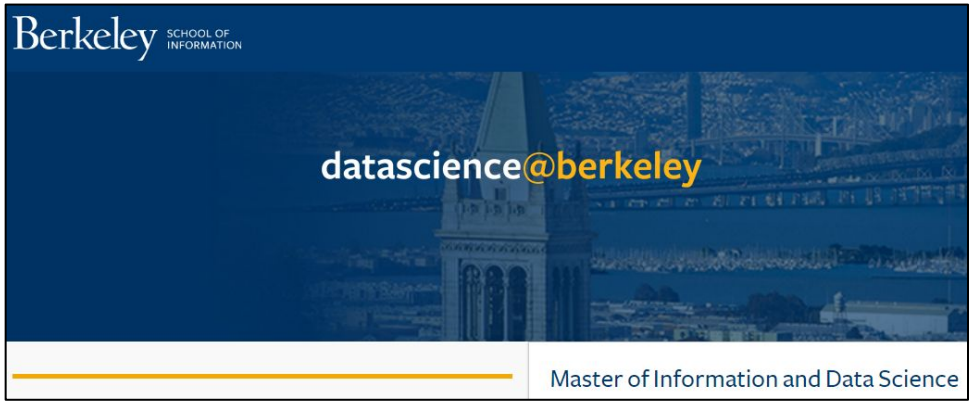
Johns Hopkins University

VirginiaTech
Invent the Future

Examples of Math-related Online MSc Programs





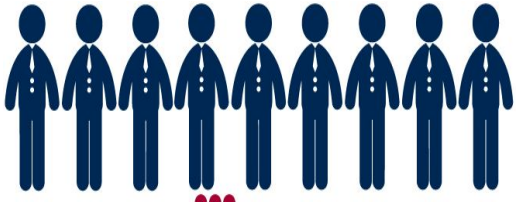


Part IV:

New Challenges & Strategies

Global Math e-Learning: Educational Challenges

- **In the past** → Students of 'traditional' MSc and PhD degrees are relatively homogeneous (similar backgrounds, training, and skills)



- **European Higher Education Area** → Many new MSc and PhD degrees are offered instead of the 'traditional' ones. New MSc and PhD students come from different backgrounds.

bologna process

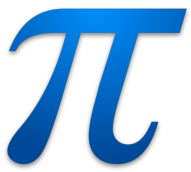
EUROPEAN
Higher Education Area

- **E-Learning Globalization** → MSc, and PhD students from different universities, nationalities, age groups, degrees, countries, etc. Students show heterogeneous levels of mathematical / analytical / programming training and skills.

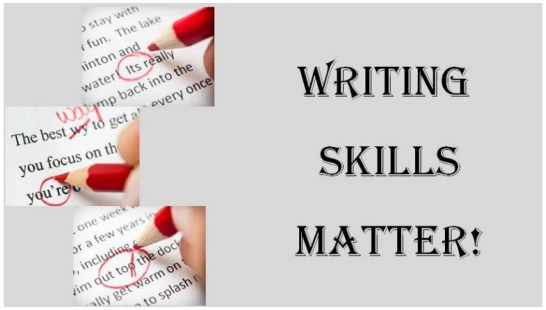
- **Challenges** → While some students show high mathematical / analytical capabilities and skills, they also show lack of other skills (e.g., programming languages, writng scientific documents in English, etc.), and vice-versa.

Example 1: Student with a Math degree

- **Strong points:** typically, good mathematical background and analytical capacity.



- **Weak points:** typically, lack of programming skills, lack of 'social' background (e.g., Management perspective), lack of ability to write scientific documents in English, sometimes lack of teamwork habits.

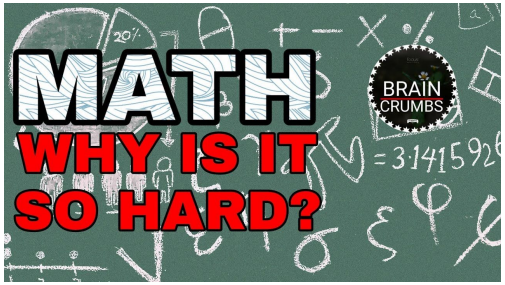


- **Challenge:** to integrate the student in the course and provide him / her with the missing skills in a timely manner.

Example 2: Student with a Computer Sci. degree

- **Strong points:** typically, good programming skills and algorithmic knowledge, ability to learn how to use new software.

- **Weak points:** typically, lack of mathematical background and analytical skills, lack of ability to write scientific documents in English.

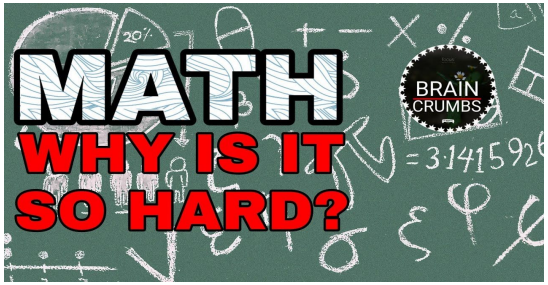


- **Challenge:** to integrate the student in the course and provide him / her with the missing skills in a timely manner.

Example 3: Student with a Management Sci. degree

- **Strong points:** typically, good writing skills, management perspective, and analytical skills; solid teamwork capacities.

- **Weak points:** typically, lack of mathematical background and programming skills.



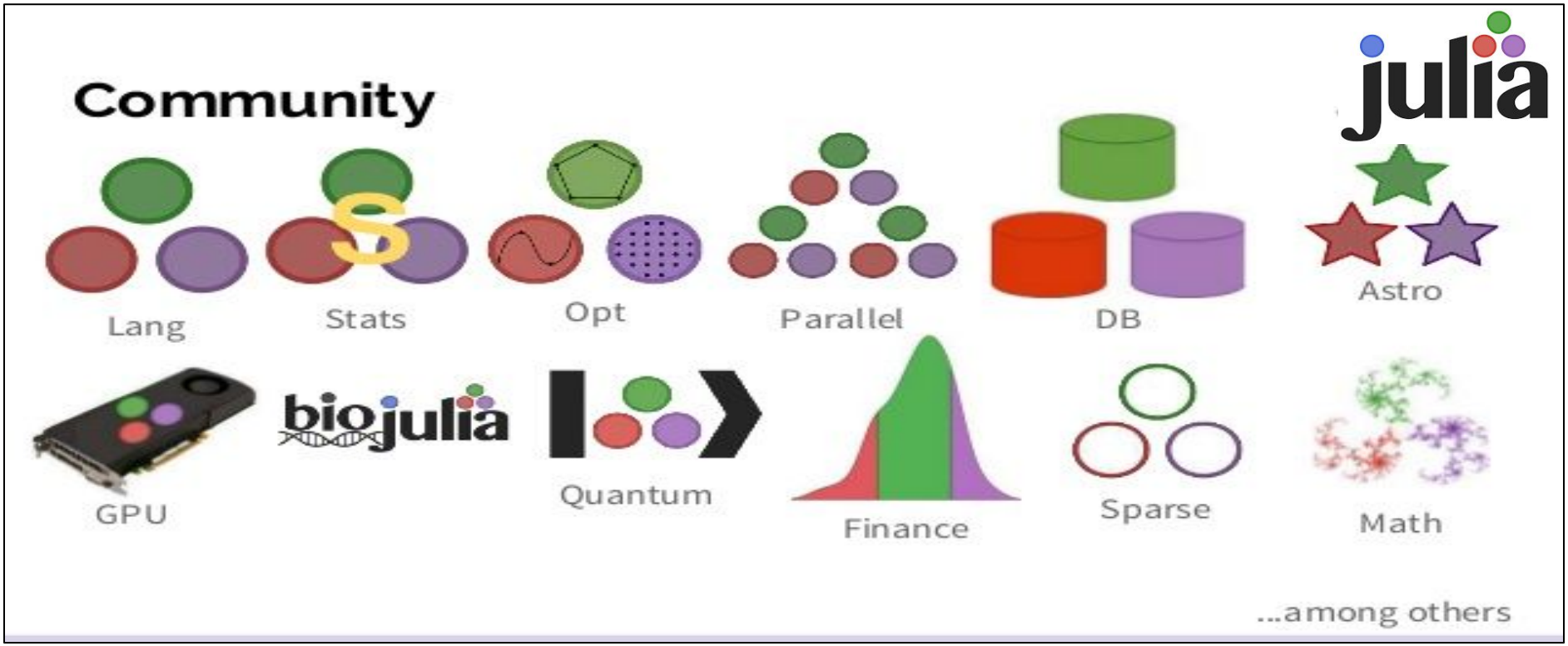
- **Challenge:** to integrate the student in the course and provide him / her with the missing skills in a timely manner.

Strategy 1: Use ETL Sci. Programming Languages

```
>>> import math
>>> math.log(100, 10)
2.0
>>> math.log(100)
4.605170185988092
>>> math.exp(4)   #e**x
54.598150033144236
```

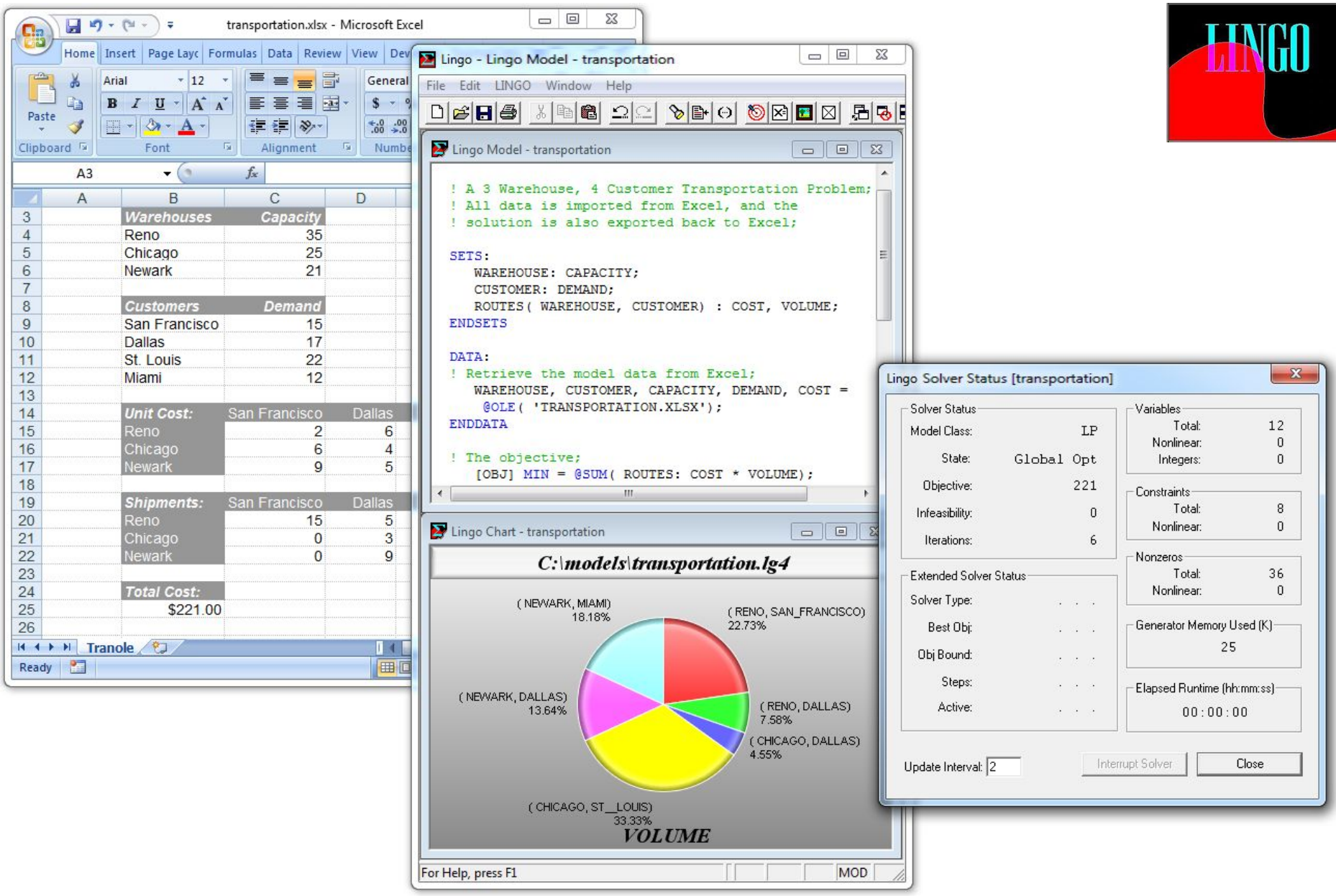
log(x, base)
logarithm of x to the given base **base** is an optional argument by default **base is e**

python™

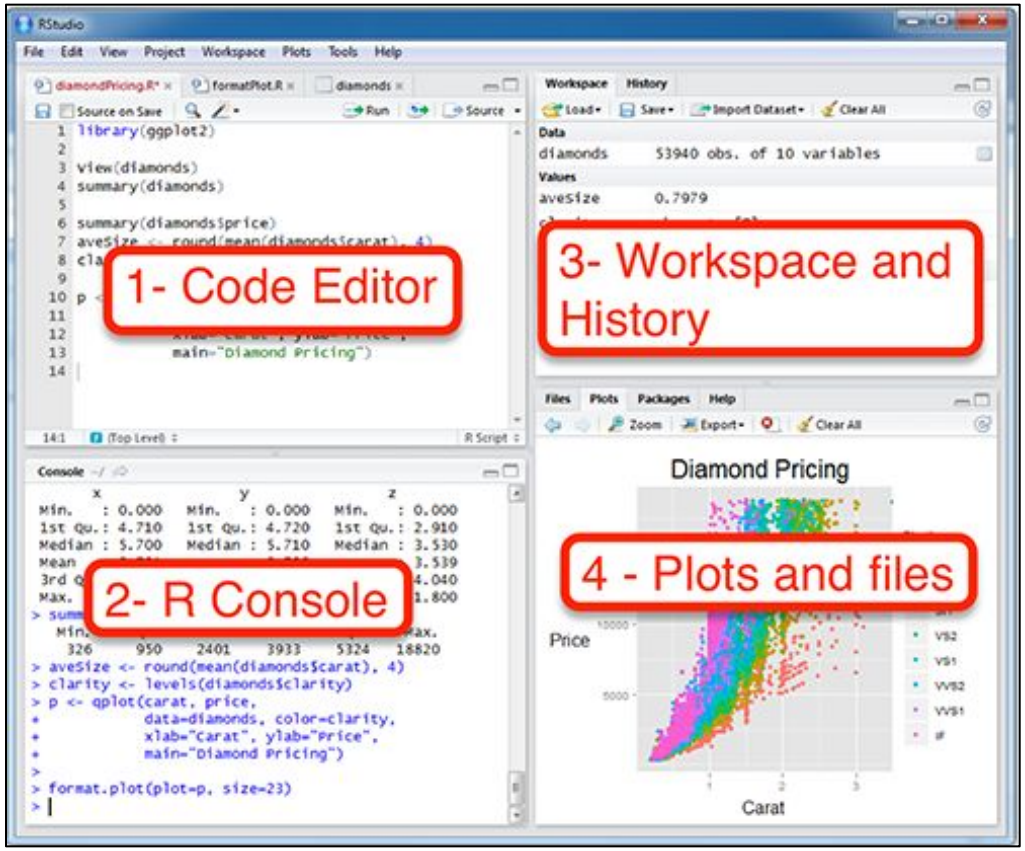


Strategy 2: Use ETL Simulation Software

Strategy 3: Use ETL Optimization Software

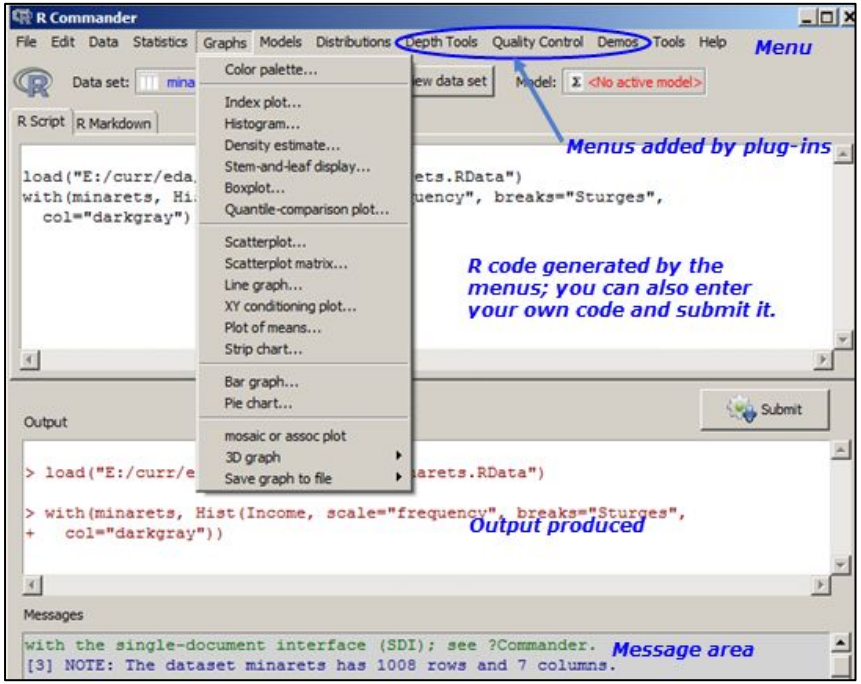


Strategy 4: Use ETL Stats / Analysis Environments

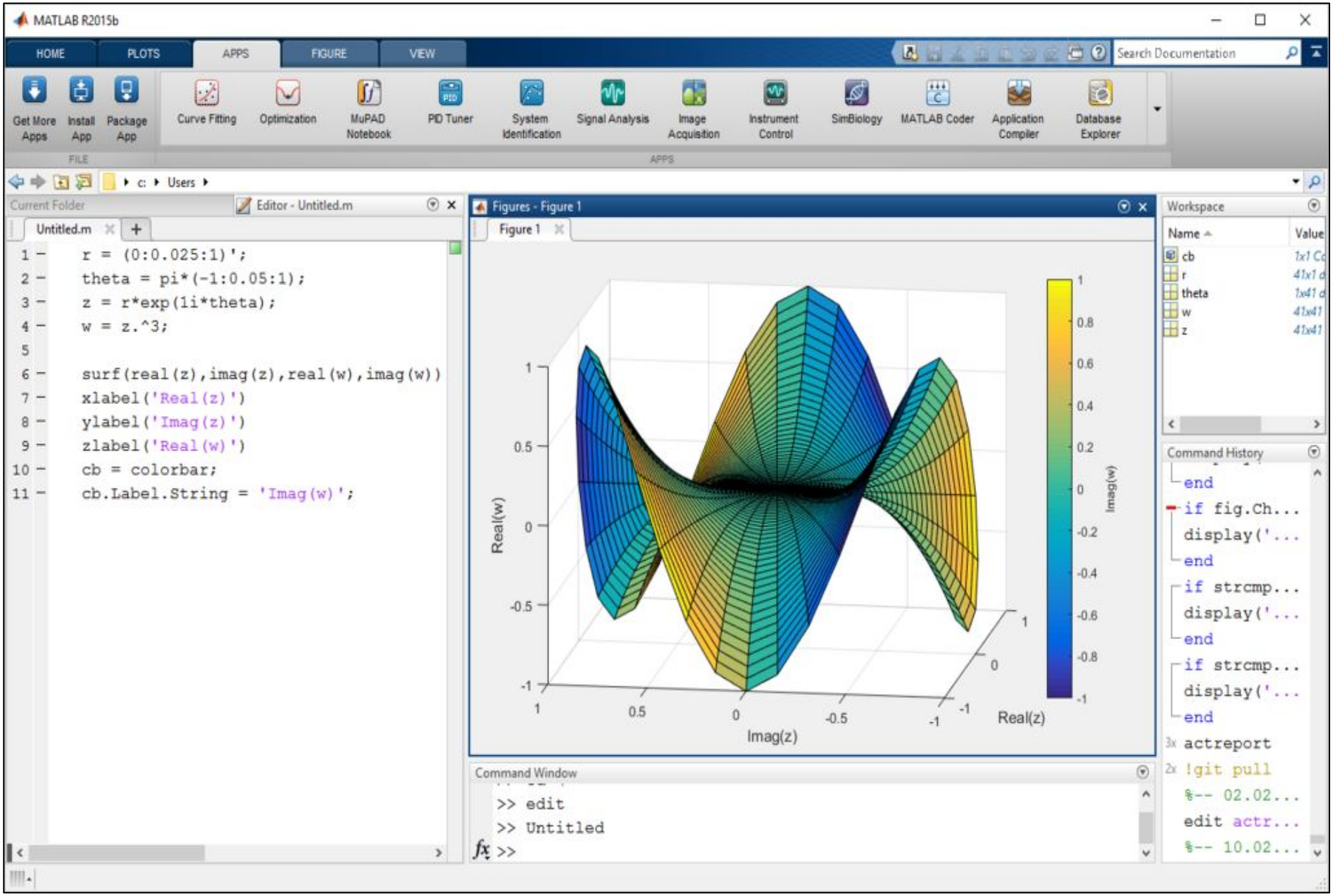


RStudio

R Commander



Strategy 5: Use ETL Math Environments



Strategy 6: Use ETL Latex Environments

Overleaf | PROJECT | HISTORY & REVISIONS | SHARE | PDF | JOURNALS & SERVICES | SuNaden

Source | Rich Text | Edit | Find | § | B | More | Preview | Manual | Auto | up-to-date and saved

```
144
145 % Each section begins with a \section{title} command
146 # Introduction
147   % \PARstart{}{} creates a tall first letter for this first paragraph
148   \PARstart{T}{his} section introduces the topic and leads the reader on to the main
    part.
149
150 % Main Part
151 # Main Part
152   % LaTeX takes complete care of your document layout ...
153   The presentation's content is summarized in the report in 4~pages.
154   % ... but you can insert a line break manually with two backslashes, if needed: \\
155   The author should fill, but not exceed, this space. \\
156   The report should be a self-contained report, so that it can be understood
    without studying additional literature.
157
158 # Format
159   The report can be written in \LaTeX{} or Microsoft Word, but \LaTeX{} is definitely
    preferred.
160   Its appearance should be as close to this document as possible to achieve
    consistency in the proceedings.
161
162   % You can cite a book or paper by using \cite{reference}.
163   % The references will be defined at the end of this .tex file in the bibliography
164   References should be cited as numbers, and should be ordered by their
    appearance (example: ``... as shown in {HOP96}, ...'').
165   Only references that are actually cited can be listed in the references section.
```

HAUPTSEMINAR DIGITALE KOMMUNIKATIONSSYSTEME 1

Guidelines for Writing a Seminar Report

Firstname Lastname

***Abstract*—The short abstract (50-80 words) is intended to give the reader an overview of the work.**

I. Introduction

THIS section introduces the topic and leads the reader on to the main part.

II. Main Part

The presentation's content is summarized in the report in 4 pages. The author should fill, but not exceed, this space. The report should be a self-contained report, so that it can be understood without studying additional literature.

III. Format

The report can be written in LaTeX or Microsoft Word, but LaTeX is definitely preferred. Its appearance should be as close to this document as possible to achieve consistency in the proceedings.

References should be cited as numbers, and should be ordered by their appearance (example: "... as shown in [1], ..."). Only references that are actually cited can be listed in the references section. The references' format should be evident from the examples in this text.

References should be of academic character and should be published and accessible. Your advisor can answer your questions regarding literature research. You must cite all used sources. Examples of good references include text books and scientific journals or conference proceedings. If possible, citing internet pages should be avoided. In particular, Wikipedia is *not* an appropriate reference in academic reports. Avoiding references in languages other than English is recommended.

Figures and tables should be labeled and numbered, such as in Table I and Fig. 1.

TABLE I
Simulation Parameters

Information message length	$k = 16000$ bit
Radio segment size	$b = 160$ bit
Rate of component codes	$R_{cc} = 1/3$
Polynomial of component encoders	$[1, 33/37, 25/37]_8$

IV. Filling this page

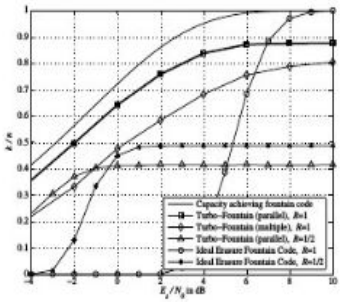


Fig. 1. Simulation results on the AWGN channel. Average throughput k/n vs E_s/N_0.

humanitate provinciae longissime absunt, minimeque ad eos mercatores saepe commeant atque ea quae ad effeminandos animos pertinent important, proximique sunt Germanis, qui trans Rhenum incolunt, quibuscum continenter bellum gerunt. Qua de causa Helvetii quoque reliquos Gallos som strasny pan virtute praecedunt, quod fere cotidianis proeliis cum Germanis contendunt, cum aut suis finibus eos prohibent aut ipsi in eorum finibus bellum gerunt. Eorum una, pars, quam Gallos obtinere dictum est, initium capit a flumine Rhodano, continetur Garumna flumine, Oceano, finibus Belgarum, attingit etiam ab Sequanis et Helvetiis flumen Rhenum, vergit ad septentriones. Belgae ab extremis Galliae finibus oriuntur, pertinent ad inferiorem partem fluminis Rheni, spectant in septentrionem et orientem solem.

V. Conclusion

This section summarizes the paper.

References

[1] J. Hagenauer, E. Offer, and L. Papke. Iterative decoding of binary block and convolutional codes. *IEEE Trans. Inform. Theory*, vol. 42, no. 2, pp. 429-445, Mar. 1996.

[2] T. Mayer, H. Jenkac, and J. Hagenauer. Turbo base-station cooperation for intercell interference cancellation. *IEEE Int. Conf. Commun. (ICC)*,

Strategy 7: Promote Scientific Reading & Writing

Anatomy of a Scientific Paper

Are All Apples Red?

by
Ida Cortland

Abstract:

We examined several apples' color. Although most are red, some are not.

Introduction:

An age-old question is: are all apples red? MacIntosh (1993) thought so. G. Smith (1999) begs to differ. We hope to resolve this issue once and for all.

Methods:

We went to the local grocery store and bought one of every apple they had. We took them home and looked at them.

Results:

We found four red apples, one green apple, and two yellow apples.

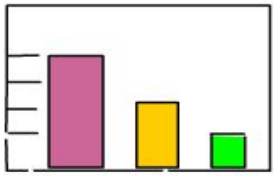


Figure 1

Discussion:

Since we found one yellow apple and two green apples, it must be true that all apples are not red. We concur with G. Smith's findings.

References:

MacIntosh (1993) *Journal of Fruit Science*. 4(3): 121-135.

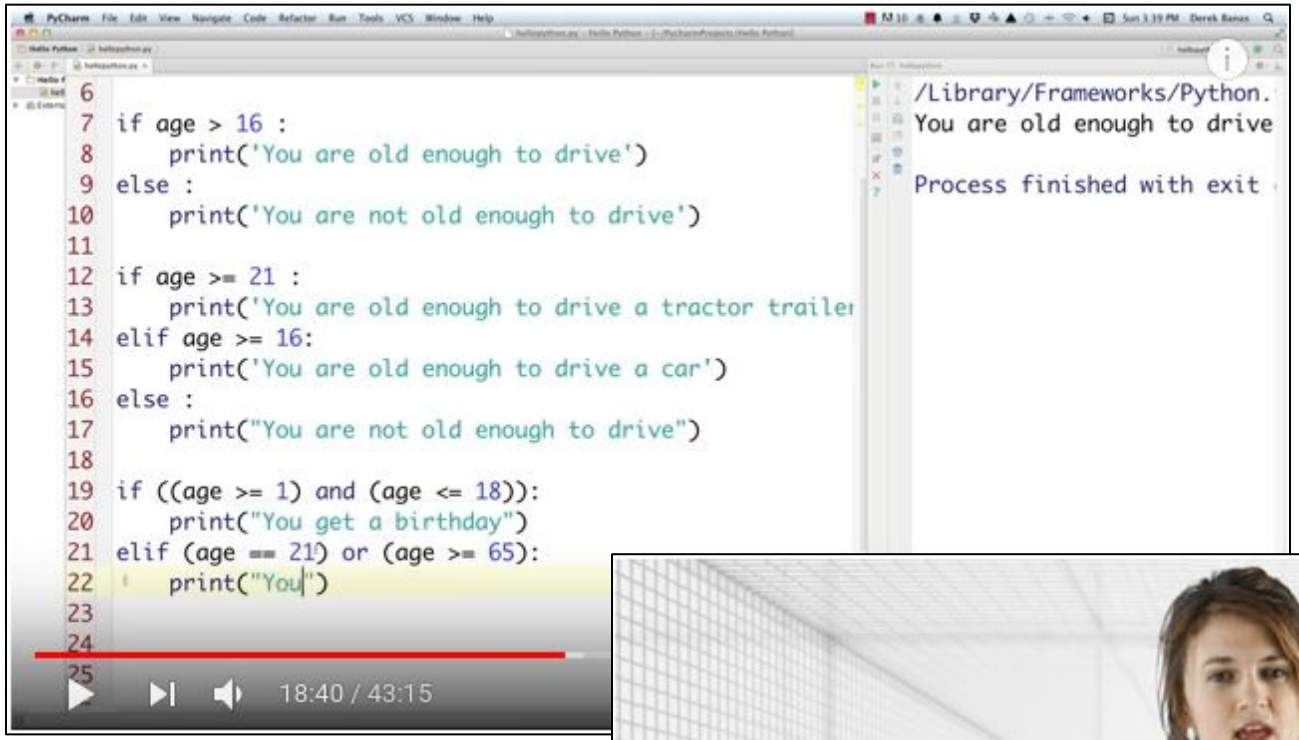
Smith, G. (1999) *Apple Technology Today*. 7(3):4-8.

Strategy 8: Teamwork for Complex Problem Solving

Complex
Problem Solvers

Analytical thinking and problem solving

Strategy 9: Some Videos can Make a Difference



YouTube

Part V:

Erasmus+ Network on Math e-Learning

Erasmus+ Jean Monnet Actions

Erasmus+ - Jean Monnet - Networks

Share

Length: 3 years

Maximum grant award:

EUR 300,000

Application deadline: 22nd February 2018 at 12:00 midday Brussels time for projects starting on 1st September of the same year.

Jean Monnet Networks foster the creation and development of consortia of international players (Higher Education Institutions, Centres of Excellence, departments, teams, individual experts, etc.) in the area of European Union studies in order to gather information, exchange practices, build knowledge and promote the European integration process across the world.

The action can also support existing networks, specifically those encouraging the participation of young researchers in EU-related themes.

For further information on Jean Monnet Networks please refer to the Erasmus+ Programme Guide.

Erasmus+ Jean Monnet Actions

- What does it support
- Who can benefit from it
- Timetable
- What support is available
- Who can apply
- How to apply

Who can apply:
A higher education institution (HEI) or other organisation active in the European integration area, established in any country of the world.

HEIs established in Programme Countries must hold a valid Erasmus Charter for Higher Education (ECHE). An ECHE is not required for participating HEIs in Partner Countries.

These projects focus on activities that cannot be achieved successfully at a national level and require the involvement of a minimum of three partner institutions (including the applicant institution) from three different countries.

- What does it support
- Who can benefit from it
- Timetable
- What support is available
- Who can apply
- How to apply
- How are applications selected

Timetable:

Step	Date
Publication of the call for proposals	25 October 2017
Deadline for submission	22 February 2018 (CET - Midday - Brussels time)
Evaluation period	5 months
Information to applicants	July 2018
Start date of action	1 September 2018

Erasmus+ JM Network on Math E-Learning @ EU

3+ partners in 3+ EU countries; traditional universities are also welcome!

Part VI:

Conclusions & More

Conclusions...

- **Math e-Learning** is growing in importance every year.
- More and more **traditional institutions** in Europe and USA are offering online MSc and PhD degrees.
- **Heterogeneity** of online global students impose new challenges on how to teach **maths online**.
- Some personal **best-practices** have been discussed. These ‘strategies’ might help to reduce the gap among different students in a global math education.
- **Cooperation** among existing online institutions is more necessary than ever if they want to keep their competitive adavantage in such a global market.

julia

Erasmus+

…. & More

Call for applications for postdoctoral research stays at the UOC

01/02/2018

UOC - Doctoral School grants programme


10th Int. Workshop in Math e-Learning (e-math 2018)
Lisbon, October 15-16, 2018

Teaching Computer Simulation and Optimization Online to Students with Different Backgrounds

thanks!

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ajuanp@uoc.edu | http://ajuanp.wordpress.com
(*) IN3 - Computer Science Dept., UOC, Barcelona, Spain