

# Taking a PhD in AI

## empirical notes

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# who am I?

- PhD, 1995 in behaviour based robotics - UNL
- 2 PhD students advised (1 waiting for exam)
  - 3 PhD students in progress
- 11 MSc students advised
  - 2 MSc students in progress
- organiser of the two PhD in informatics seminars of UNL, in 1999 and 2000
- currently coordinator of the PhD program in informatics at UL

# PhD in AI – talk overview

- PhD in general
  - the student's point of view
  - the supervisor's point of view
- PhD in AI
  - institutional environment
  - the thesis

# the student's side



It all depends on the advisor

# the advisor's side

that's student's work



# a compromise ?

- **Yes**

(the politically correct answer)

- depends on the advisor
- depends on the student
- depends on the institution
- depends on the context
- ...

# bottom line

- committing to one single cause

**student's motivation**

# motivated type



# mathematical formulation

- “Newton's” 2<sup>nd</sup> law of graduation

$$age_{PhD} = \frac{flexibility}{motivation}$$

- *the age of a doctoral process is directly proportional to the flexibility given by the advisor and inversely proportional to the student's motivation*

singularity at  $m=0$

# the other 2 laws (for completeness sake)

- 1<sup>st</sup>
  - *a PhD student in procrastination tends to stay in procrastination unless an external force is applied to it*
  
- 3<sup>rd</sup>
  - *for every action towards PhD there is an equal and opposite distraction*

# student's helpers

## 1.work discipline

- regular working periods
- plus some extras, when needed
- self-control time **really** dedicated to research

## 2.accept criticism

## 3.research bibliography

- **a lot!**

## 4.use advisor as such

# student's dismay

- it has been done before
  - helper 3
- lack of ideas
  - helpers 1 and 3
- paper rejection
  - helpers 2 and 4
- is it enough?
  - helper 4

# advisor's role

- form student
  - searching & reading refs.
  - conducting research – ask the important questions
  - reviewer activity
- advise
  - help to establish milestones & deadlines
  - support when needed
  - pressure when needed
  - hold back when needed

# advisor's helpers

- keep contact
  - meetings (weekly), e-mail
  - quickly answer requests
- maintain a group
  - progress meetings
  - journal club
  - news
- promote external contacts

# what is an AI thesis?

- original work
  - capable of synthesising into a journal paper in the end of the PhD work or after

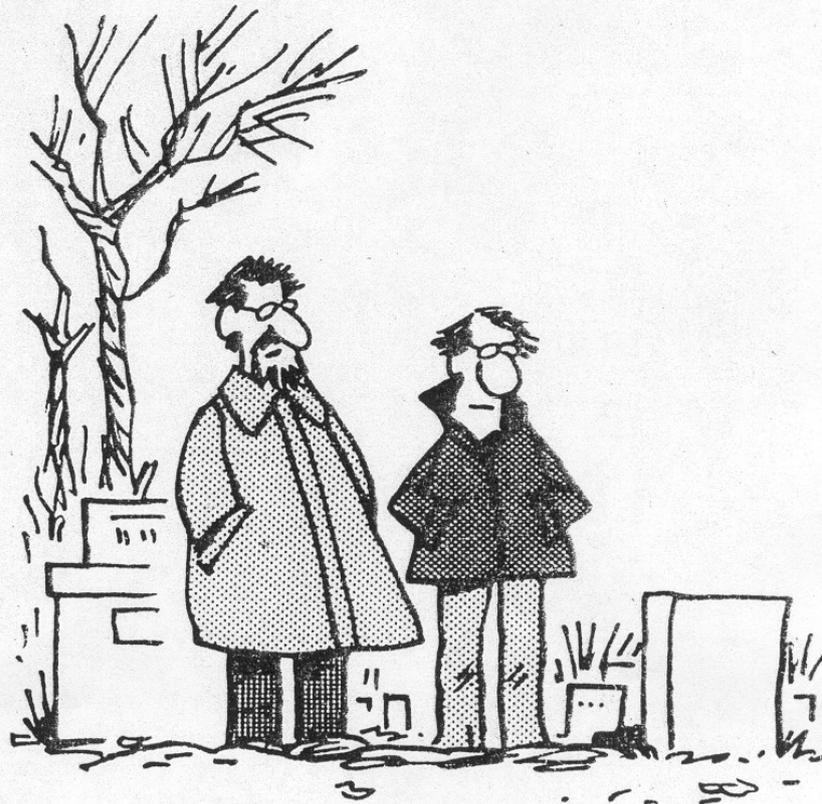
in the meantime...

→ publish ideas in workshops

→ publish intermediate results in conferences

# publish or... perish

## Berry's World



*Jim Berry*

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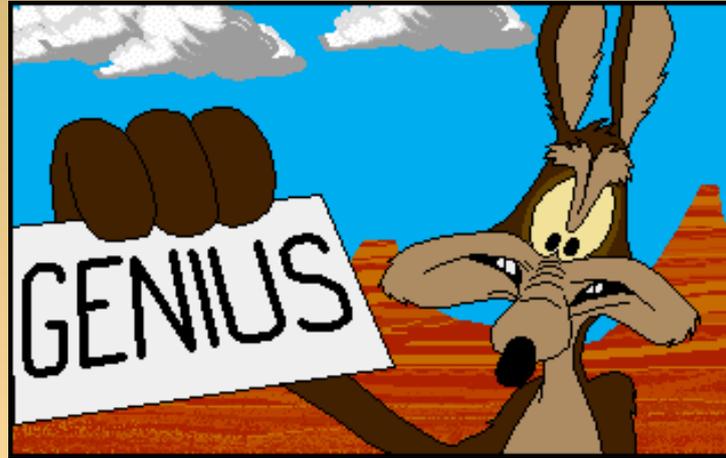
*"He didn't publish, so he perished."*

# PhD in AI

- AI is a scientific area
  - requires scientific approach

**problem**  
**hypothesis**  
**validation**

# how to succeed?



genius is

1% inspiration and

99% perspiration

*Thomas Edison*

# institutional integration

- AI is not a core subject in computer science
  - in some institutions is regarded as **marginal**
  - *fundamentalists* may look down on it
  - good support from the group is important

# AI vs. CS et al.

- AI has invaded some research in CS and other domains
  - A\* vs. Dijkstra's algorithm
  - optimization and decision vs. Operations Research

# inside AI

- hélas! *fundamentalism* exists also in AI
  - areas new to AI took time to get accepted
  - GOFAI acronym may have helped...
  - may not be blocking but increases difficulties

# institutional helpers I

- maintain a PhD program
  - similar requirements for all areas
  - AI being one of them
    - tends to smooth things
- PhD students' seminars
  - students presence mandatory
  - significant faculty presence
  - promote discussion

# institutional helpers II

- yearly open progress evaluation
  - by faculty
- with specific recommendations
  - for students
- assessment of advisor's activity
  - low requirements (publications)?
  - long duration of PhDs?
  - restrictions in case of bad results

# institutional helpers III

- advisory committee
  - to approve PhD proposal
  - to follow an advise at least on a yearly basis
- committee assessment
  - thesis should list the committee members
  - public responsibility towards community

# AI work

- theoretical – mathematics, natural sciences
  - prove some new theoretical results
  - produce a new model / theory (tested with data)
- technique - engineering
  - new / improved / applied to new type of problems
  - results of its application better than previous

experiences supported by sound statistics

# AI work – getting fishy...

- framework
  - combination of techniques (?)
    - more a subject of MSc thesis
- methodology
  - this is really fishy stuff...
  - are there others to compare?
  - does it provide an advancement in solving some problem?
    - how to measure?

# student & advisor

- **student**

  - search literature

  - produce /explore ideas

    - ask questions

    - be bold

  - be (very) proactive

  - build usable prototypes

    - if needed

- **advisor**

  - suggest sources

  - guide student exploring  
**his** ideas

  - avoid “work for the next  
paper”

    - in favour of continuous  
solid work

# research report

- write down all your research
  - in one single document – **research report**
  - it may become your PhD dissertation
  - even if not:  
**several papers will spin off from it**

# publishing - where?

- avoid scientific tourism
- publish in the really important conferences
  - IJCAI, AAAI, ECAI, or more specific ones, ICANN,...
  - it's harder, but better return/€
- publish in EPIA
  - and other specific Portuguese conferences
  - it's important to place yourself in the community

# PhD student requirements

- must be able to carry independent in-depth research
  - critical analysis capability
  - look for additional refs.
  - contact other researchers
  - **& motivation**
- in the absence of these, should not continue with PhD



# bad modelling happens...



# the true (motivated) PhD student

- defends his work!
  - because he has built it in a solid way
  - knowing its limitations
- always tries to overcome hurdles!
  - a paper was rejected?  
get your act together and then...  
use reviews to improve your paper and resubmit it!

# PhD in the end

- is hardly an historical break-through
  - Q-learning comes close in AI
- student should be a world class expert on his subject
- and he must be able to put his work in perspective

# advisor's check-list

- can student be a good reviewer?
- can student supervise post-graduate students?
- would I like to have him as a colleague?
- would I like to have him as advisor?
  
- *break the mediocrity cycle:  
mediocre PhD students will produce even more  
mediocre PhD students*

Michael Athans

# some references

- Alan Bundy – Univ. Edinburgh

<http://homepages.inf.ed.ac.uk/bundy/>

- Manuel Bloom

<http://www.cs.cmu.edu/~mblum/research/pdf/grad.html>

- How to do Research at the MIT AI Lab

<http://www.cs.indiana.edu/mit.research.how.to/mit.research.how.to.html>

- Michael Athans, Reflections on Doctoral Research, 2000, SPDDI, UNL

**keep up the good work!**