Prof. Dr. Frank J. Furrer:

Hauptseminar Summer Term 2017:

From *ALGORITHMIC* Computing to *AUTONOMIC* Computing

Kick-Off Lecture April 19, 2017

What the Participants will learn:

1. Do focused research in a specific area («Autonomic Computing»)
2. Author a **good** paper
3. Learn (or perfect) the use of TeX®
4. Experience the peer-review process
5. Hold a **convincing** presentation
6. Broaden your perspective in Information Technology

Kick-Off Meeting Schedule (today):

Part 1: Seminar Organization

Part 2: «Autonomic Computing»: Introduction

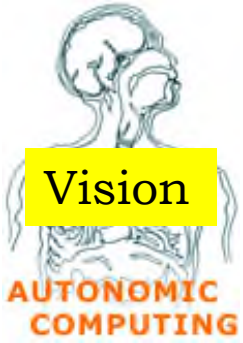
Part 3: Principles of a good paper

Part 4: Principles of a good presentation

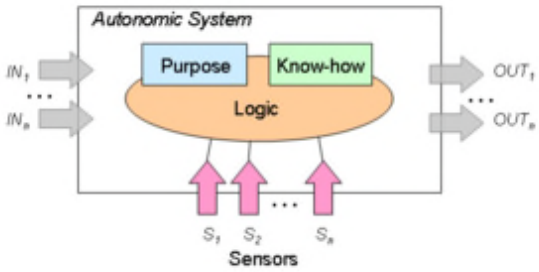
https://www.theproducersperspective.com

Part 1: Seminar Organization

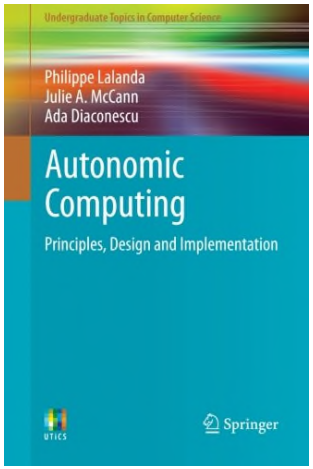
Mandatory Reading (1/2):



[1] The seminal work:
IBM Research Paper, 2001: ***Autonomic Computing – IBM's Perspective on the State of Information Technology***.
Downloadable from:
http://people.scs.carleton.ca/~soma/biosec/readings/autonomic_computing.pdf [last accessed: 2.2.2016]



[2] Introduction to the Architecture:
IBM White Paper: An architectural blueprint for autonomic computing. 3rd edition, June 2005.
Downloadable from: http://www-03.ibm.com/autonomic/pdfs/AC%20Blueprint%20White%20Paper%20V7.pdf [last accessed: 2.2.2016].



[3] The fundamental knowledge:

Philippe Lalanda, Julie A. McCann, Ada Diaconescu:

Autonomic Computing – *Principles, Design and Implementation*. Springer-Verlag, London UK, 2014. ISBN 978-1-4471-5006-0.

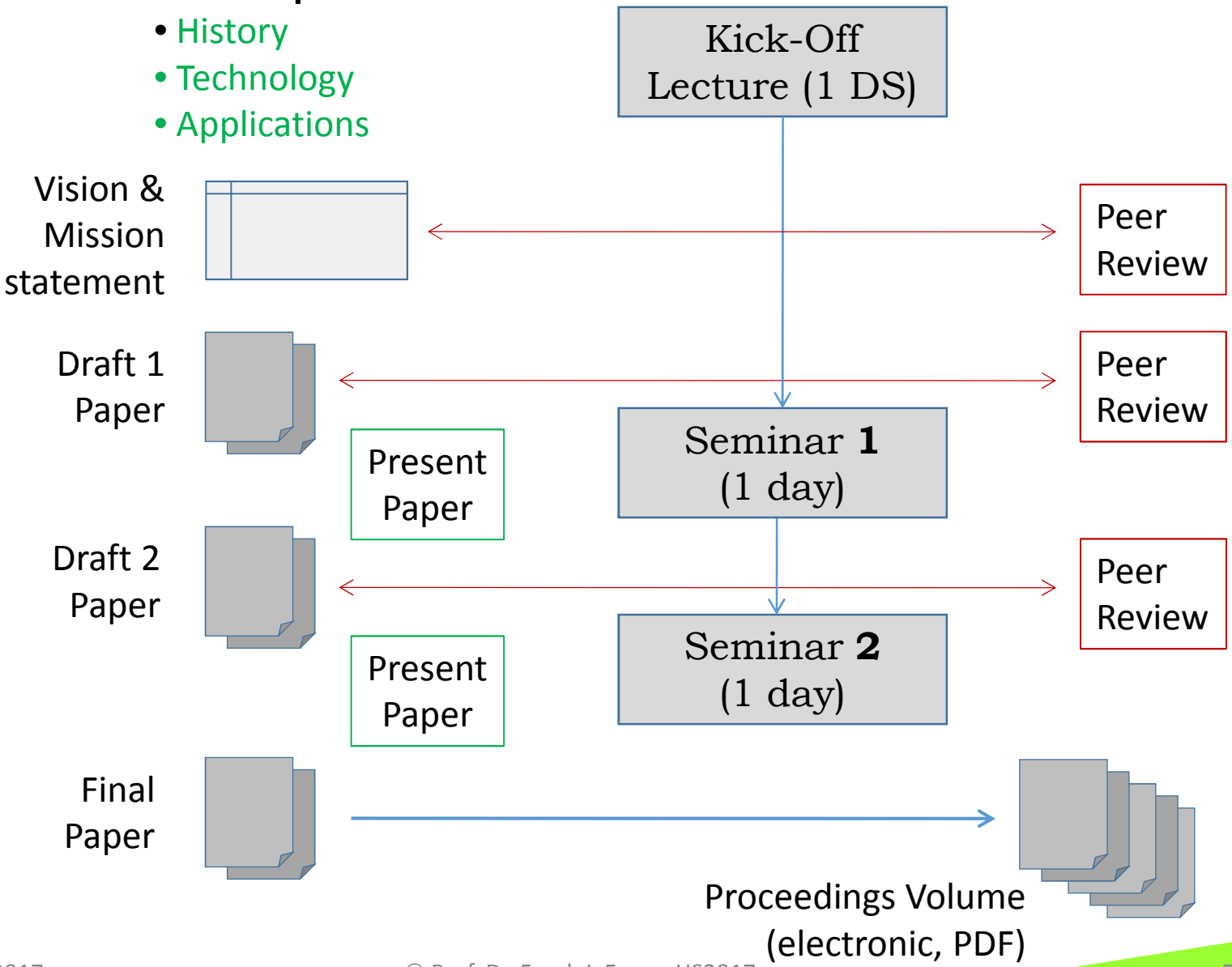
Mandatory Reading (2/2):

Cyber-Physical Systems:

[4] NIST Engineering Laboratory: Cyber-Physical Systems. Downloadable from: https://www.nist.gov/el/cyber-physical-systems [last accessed: 23.2.2017]

Select topic:

- History
- Technology
- Applications



- 3 ECTS Credits
- An assessment with a grade

if:

Full attendance at:

Kick-Off Meeting (Introduction): Wednesday, **April 19**, 2017 / 11:10 – 12:40 in APB/INF 2101

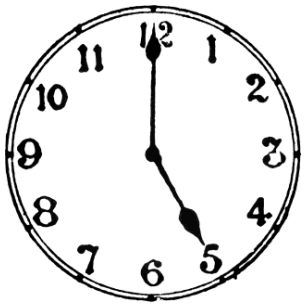
Seminar Day 1: Wednesday, **June 7**, 2017 / 09:20 – 10:50 & 11:10 – 12:40 in APB/INF 2101

Seminar Day 2: Wednesday, **July 12**, 2017 / 09:20 – 10:50 & 11:10 – 12:40 in APB/INF 2101

Three useful and helpful peer reviews produced

Two rich and careful presentations given

Timely delivery of an acceptable paper



Expected Effort (2 SWS): **> 90 working hours**

HS Schedule Part 1

Hauptseminar Kick-Off Meeting	**Wednesday, April 19, 2017: 11:10 – 12:40 (3. DS)** **Room APB/INF 2101**	Introductory Lecture by Prof. Frank J. Furrer
Select 2 **peer reviewers** from the participants Note: **All** papers will also be reviewed by Dr. F.J. Furrer (as 3rd peer reviewer)	Monday, April 24, 2017	e-mail your choice to: • All participants • frank.j.furrer@bluewin.ch
Deliver your **choice of working field** (i.e. **F1**, **F2** or **F3**) and a short **vision/mission statement** to the 2 peer reviewers and to F.J. Furrer Note: Content and structure of the "vision/mission statement" will be explained in the Kick-Off Meeting	Friday, April 28, 2017	e-mail your choice to: • All participants • frank.j.furrer@bluewin.ch
Feedback from Reviewers	Friday, May 5, 2017	By e-mail from: • The peer reviewers • frank.j.furrer@bluewin.ch
Deliver 1st draft of both your storyline and your paper to your peer reviewers Note: Content and structure of the "storyline" and "paper" will be explained in the Kick-Off Meeting	Friday, May 19, 2017	e-mail your storyline and paper: • Peer reviewers • frank.j.furrer@bluewin.ch
Feedback from Reviewers	Friday, May 26, 2017	By e-mail from: • The peer reviewers • frank.j.furrer@bluewin.ch

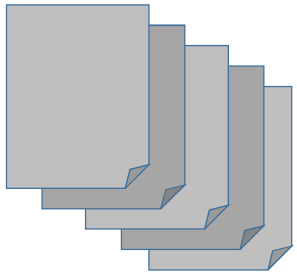
2 documents

HS Schedule Part 2

1st Seminar Day	**Wednesday, June 7, 2017: 09:20 – 10:50/11:10 - 12:40 (2. + 3. DS)** **Room APB/INF 2101**	• Participants presentations • Peer discussions, Feedback on style & content
Deliver 2nd, improved draft of your paper to your peer reviewers	Friday, June 23, 2017	e-mail your paper: • Peer reviewers • frank.j.furrer@bluewin.ch
Feedback from Reviewers	Monday, July 3, 2017	By e-mail from: • The peer reviewers • frank.j.furrer@bluewin.ch

HS Schedule Part 3

2nd Seminar Day	**Wednesday, July 12, 2017: 09:20 – 10:50/11:10 - 12:40 (2. + 3. DS)** **Room APB/INF 2101**	• 2nd participants presentation • Peer discussions, Feedback on style and content
Deliver final version of your paper	Latest: Monday, August 7, 2017	e-mail your paper to: • All participants • frank.j.furrer@bluewin.ch
pdf-volume of collected papers ready	September 2017 [may be delayed because of TUD procedures]	Downloadable from the seminar website



Formats:

Paper: **LaTex**

Presentation: **Powerpoint**

Please use the **Template** [L_ATex & Word]:

"Springer LNCS" for your paper.

Downloadable from:

https://www.springer.com/gp/computer-science/lncs/conference-proceedings-guidelines

[last accessed: 6.4.2017]

This seminar will work on the central theme:
"Which are the history, the technologies and the applications of Autonomic Computing?"


https://www.sparkenergy.com

Each participant choses one of the 3 fields:

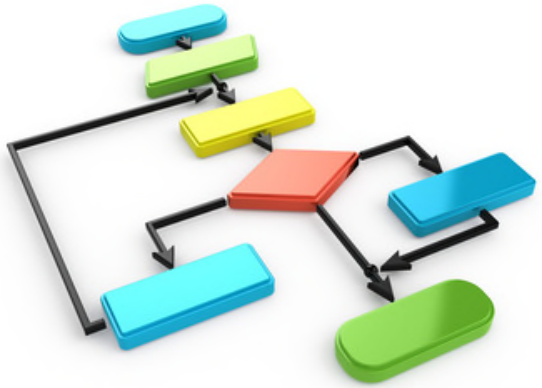
F1: Research and describe the **historical development** from algorithmic computing to today's autonomic computing;

F2: Investigate which **autonomic computing technologies** use the MAPE-K architecture today and in the future;

F3: Identify and document a number of **promising applications** of cyber-physical systems (CPS) based on autonomic computing.

Part 2: Autonomic Computing «Introduction»

Algorithmic Computing



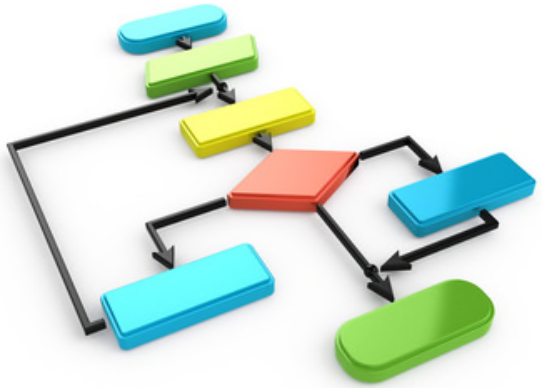
http://www.bobology.com

You use **code** to tell a computer what to do ⇐ "Program"

Before you write code you need an **algorithm**

An algorithm is a **list of rules** to follow in order to solve a problem

Algorithmic Computing



http://www.bobology.com

An algorithm is a **list of rules** to follow in order to solve a problem

http://kingofwallpapers.com

The «programmer» must think of all *possible* cases and decisions *beforehand*

Example:
Algorithmic Computing (1/4)

http://static3.businessinsider.com

Algorithmic Computing

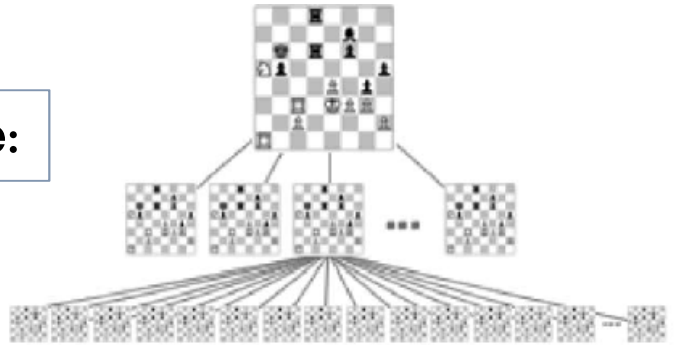
Deep Blue versus **Garry Kasparov** was a pair of six-game chess matches between world chess champion Garry Kasparov and an IBM supercomputer called Deep Blue.

The match was played in New York City in 1997 and won by **Deep Blue**.

The 1997 match was the first defeat of a reigning world chess champion to a computer under tournament conditions

Example: Algorithmic Computing (2/4)

Algorithm Structure:

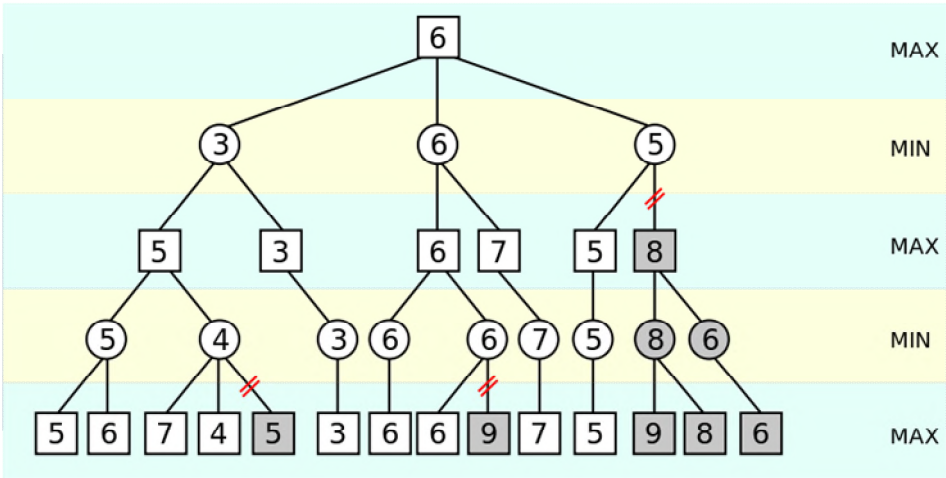


1. Model Chess as a tree structure

Deep Blue would typically search to a depth of between six and eight moves based on 11.38 GFLOPS power

2. Define an Evaluation Function

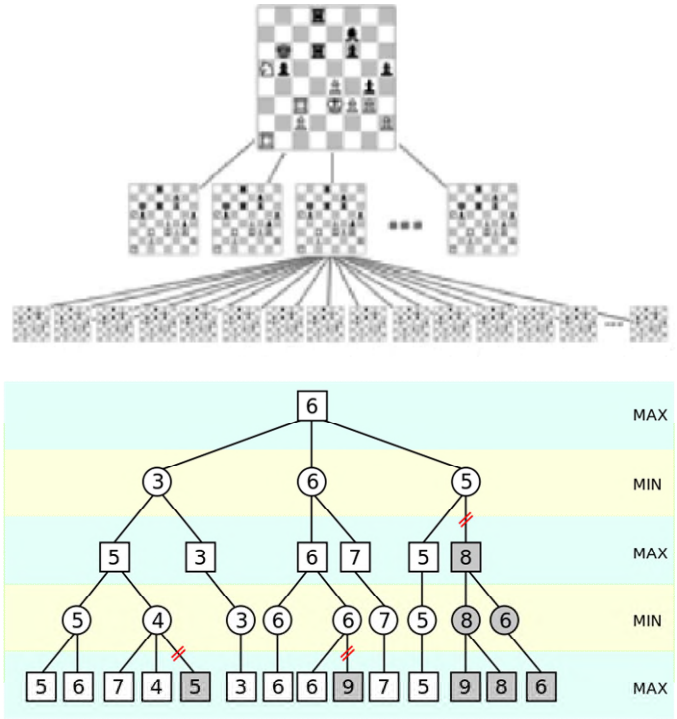
3. Use Minimax Algorithm



4. Heuristics/Optimizations

Example: Algorithmic Computing (3/4)

https://images.chesscomfiles.com



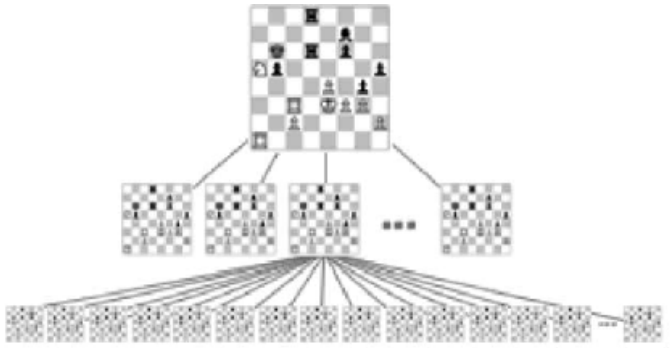
http://www.randalolson.com

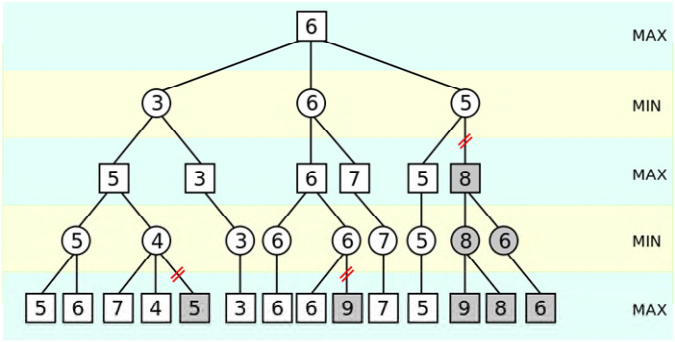
1) The problem (game) is completely ***determinstic***

2) The context is completely ***known*** and ***stable***

3) All stakeholders have ***full*** information (real-time)

Example: Algorithmic Computing (4/4)





Position Evaluation

Value Assessment

Decision

Evaluation:
How many moves?

http://blog.pdus2go.com

Algorithm
+
Computing Power

http://cbttherapyuk.com

What if the problem:

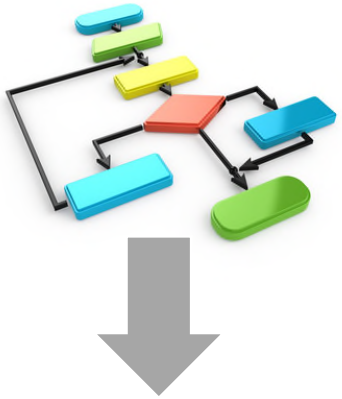
- **is not fully defined?**
- **or the environment is uncertain?**

What if situations:

- **are too complex to be predicted?**
- **or the environment is changing dynamically?**

https://s3.amazonaws.com

http://www.bobology.com



The algorithmic approach **fails**!

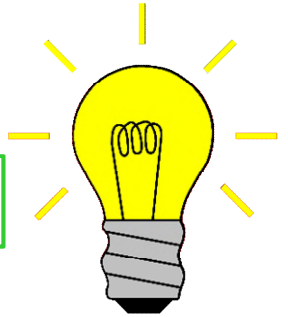
http://thumbs.carbonated.tv

Why?

1) ***Incomplete*** information
2) Dynamically ***changing*** environment (context)
3) ***Unforeseen*** cases / Unmanageable ***complexity***
4) ***Emerging*** behaviour

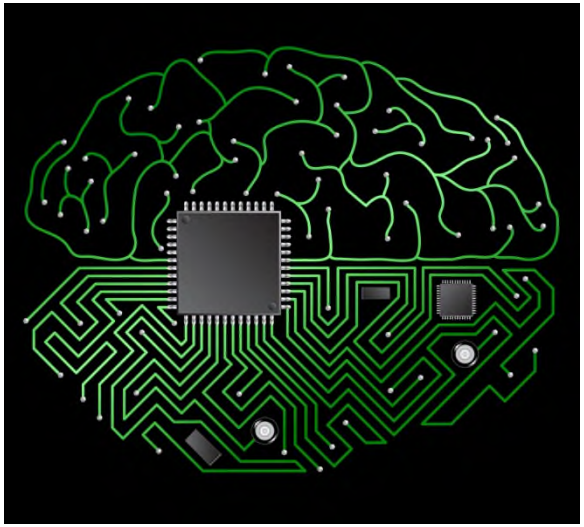
The algorithmic approach **fails**!

Is there a solution to the problem?



http://images.clipartpanda.com

YES: … we need a higher level of software technology



http://news.mit.edu

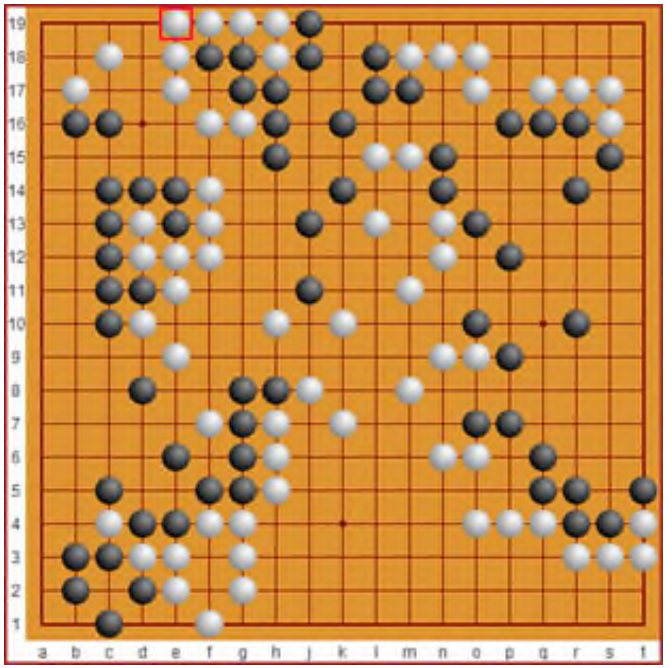
… making use of ***artificial intelligence***

Example 1: Non-algorithmic computing (1/5)

«**GO**» is a strategy board-game which was invented 2`500 years ago in China.

https://fr.wikipedia.org

Board: 19 x 19 lines, unlimited number of black and white stones



http://www.brettspielnetz.de

Goal: Occupy as much territory as possible

Example1 : Non-algorithmic computing (2/5)

1. The board is empty at the onset of the game (unless players agree to place a handicap).
2. Black makes the first move, after which White and Black alternate.
3. A move consists of placing one stone of one's own color on an empty intersection on the board.
4. A player may pass their turn at any time.
5. A stone or solidly connected group of stones of one color is captured and removed from the board when all the intersections directly adjacent to it are occupied by the enemy. (Capture of the enemy takes precedence over self-capture.)
6. No stone may be played so as to recreate a former board position.
7. Two consecutive passes end the game. However, since black begins, white must end the game.
8. A player's territory consists of all the points the player has either occupied or surrounded.
9. The player with more territory wins.

https://en.wikipedia.org/wiki/Rules_of_go

Example1: Non-algorithmic computing (3/5)

https://static01.nyt.com

Number of different positions on the GO-board: ~ **4,63 x 10^{170}**

Chess: ~**10^{43}**

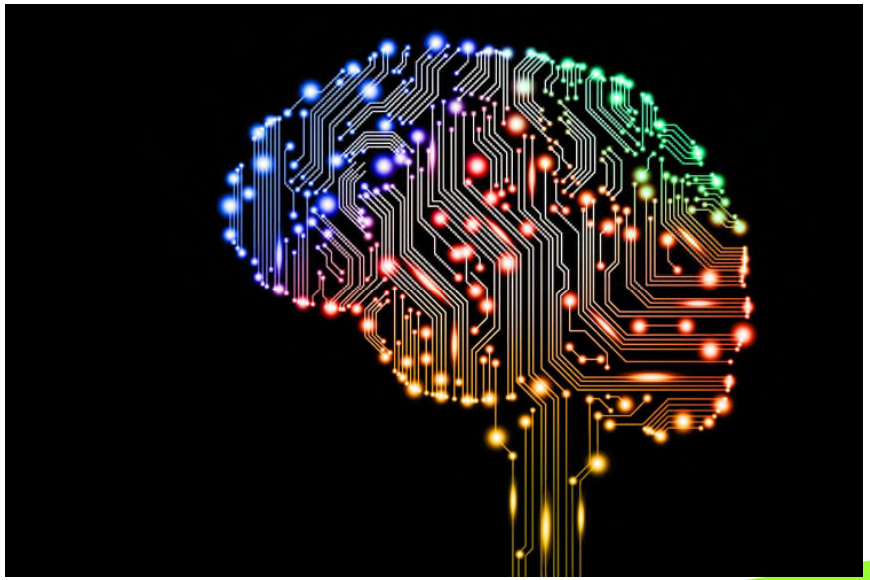
# of atoms in the universe: ~**10^{80}**

Example 1: Non-algorithmic computing (4/5)

http://www.watson.ch

March 2016: The AI-program «AlphaGO» wins a tournament against the GO World champion Lee Sedol 4:1

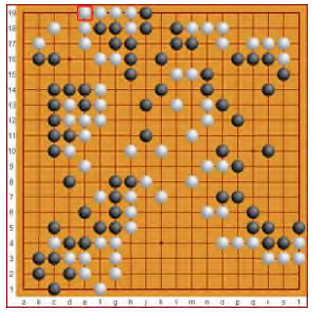
Impressive/Worrying:
«AlphaGO» is **NOT** an algorithm, but a self-learning software [Deep Learning]

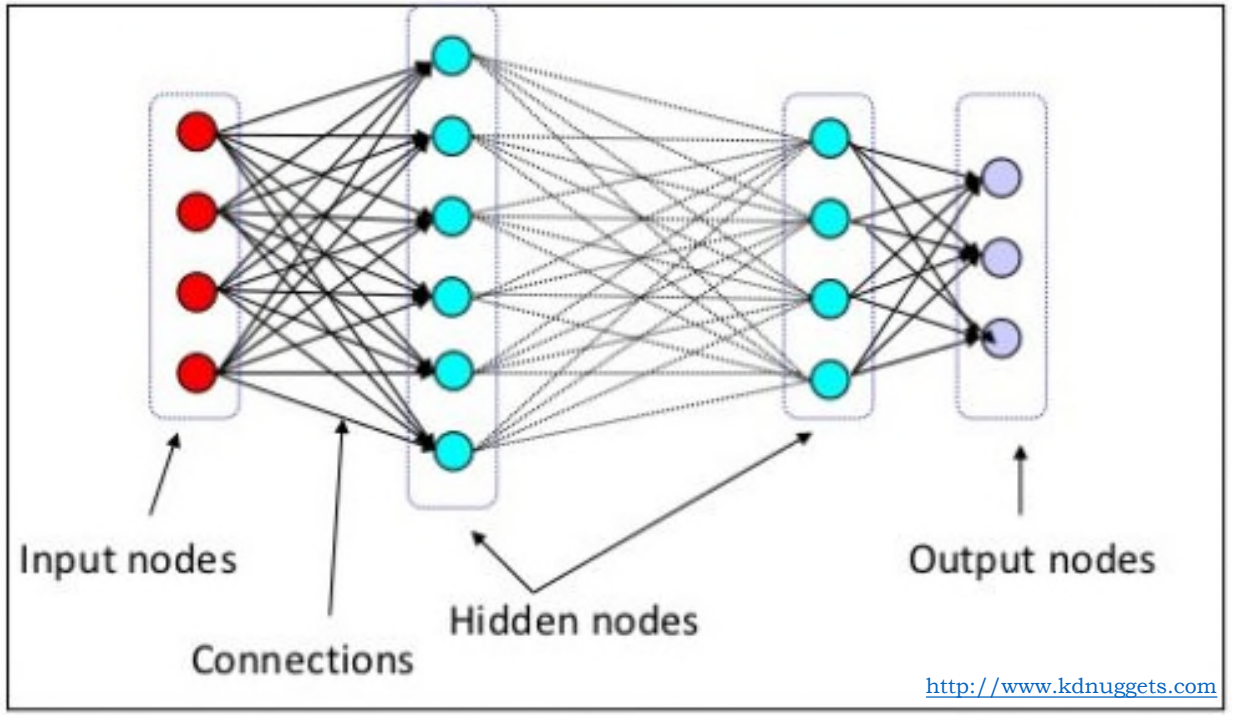


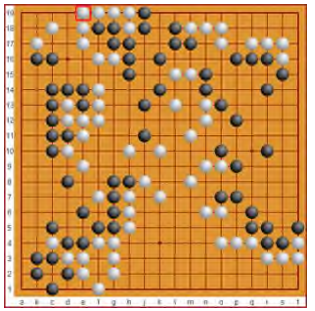
http://www.digitaltrends.com

Example 1: Non-algorithmic computing (5/5)

«AlphaGO» is **NOT** an algorithm, but a *self-learning* software
[Deep Learning in Neural Networks]







… we know the full configuration of the neural network:
But we have NO chance to ever understand its inner workings!

Example 2: Non-algorithmic computing (1/2)

Poker game: «**Texas Hold em'all**» is a card game 1:1 where strategy & bluffing is important

https://www.pokervip.com/strategy-articles/poker-rules/texas-holdem

# of different hands: ~ $\mathbf{10^{160}}$

# of atoms in the universe: ~$\mathbf{10^{80}}$

Example 2: Non-algorithmic computing (2/2)

Poker Tournament January 2017:

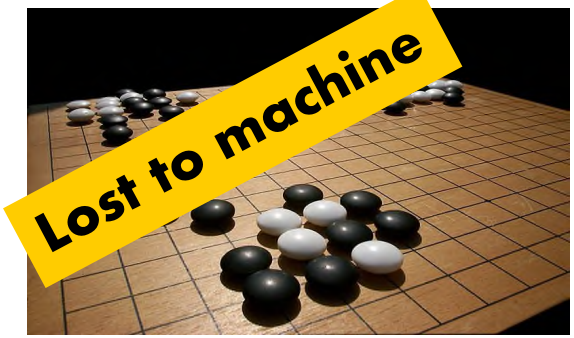
Our representatives of humanity:
Jason Les, Dong Kyu Kim, Daniel McAulay and Jimmy Chou

kept things relatively tight at the outset.

At the end of day 20 and after 120,000 hands, the AI-program **Libratus** claimed victory with daily totals of $206'061 in theoretical chips and an overall pile of $1'766'250

http://www.cmu.edu/news/stories/archives/2017/january/AI-tough-poker-player.html

AUTONOMIC COMPUTING

	Complexity [computational]	Information	Learning Technology
	very high ~10^{43}	complete	NONE algorithmic + heuristics «**DeepBlue**»
	astronomical ~ **4,63 x 10^{170}**	complete	Neural network + deep learning «**AlphaGO**»
	astronomical ~ **10^{160}**	incomplete	Counterfactual regret minimization «**Libratus**»

«Lost to machine»:

What made the difference ?

http://www.cs.toronto.edu

Artificial Intelligence,
especially:
MACHINE LEARNING

Autonomic Computing

Autonomic Computing: **Some History**

2001

Paul Horn, IBM

http://elpais.com

Concept of

«Autonomic Computing»

Paul Horn, IBM

[National Academy of Engineers at Harvard University in a March 2001 keynote]:

"**Autonomic Computing**": The system makes decisions on its own, using high-level policies; it will constantly check and optimize its status and ***automatically adapt*** itself to changing conditions

AUTONOMIC COMPUTING

Original objective:
Self-management of large computing infrastructures

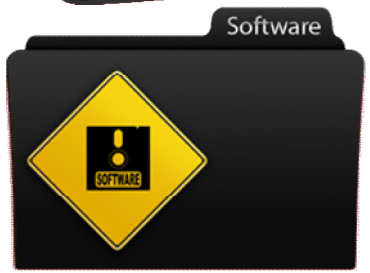
>5'000 changes/day

Changes

60'000 Servers

2'000 Routers

10'000 Business Databases



12'000 Business Applicati

90'000 Workstations

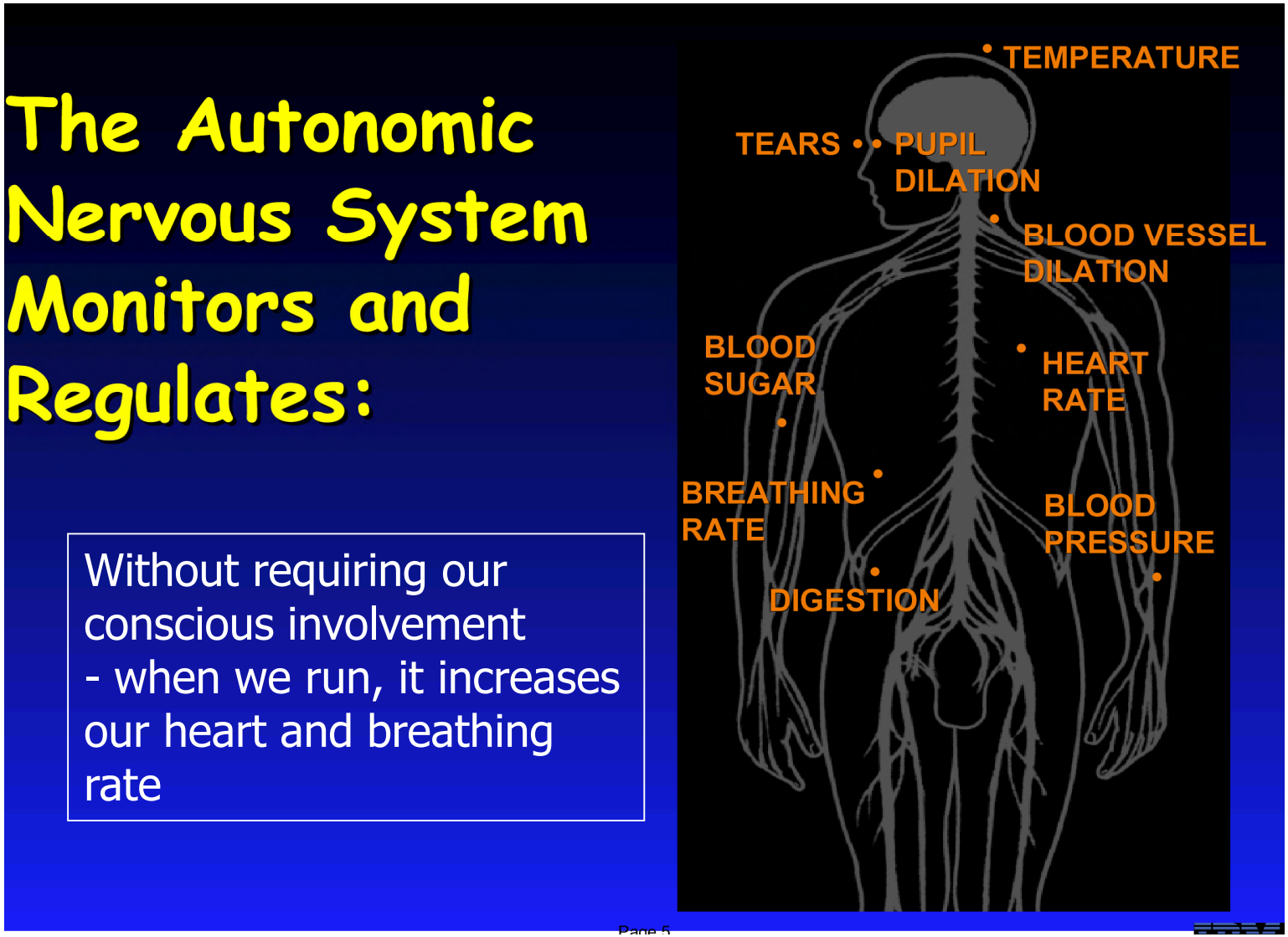
Disruptions

~ 250 disruptions/h

Initial self-* properties:
- self-configuring
- self-healing
- self-protecting
- self-optimizing

AUTONOMIC COMPUTING

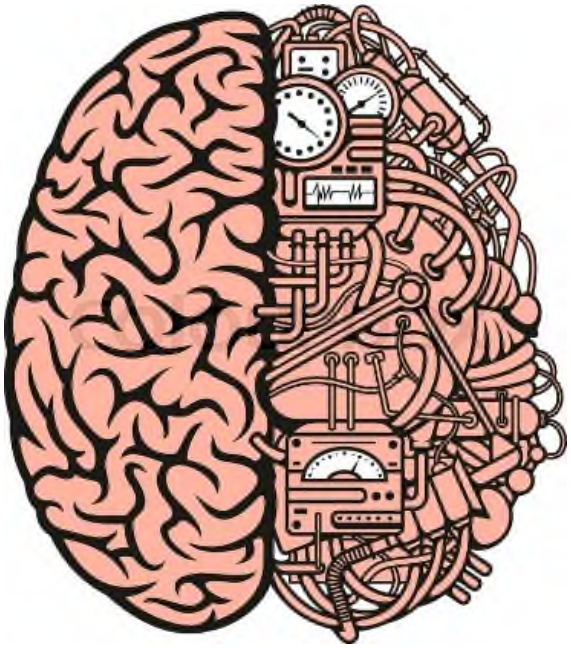
Autonomic Computing: Convergence of Information Technology and Biology



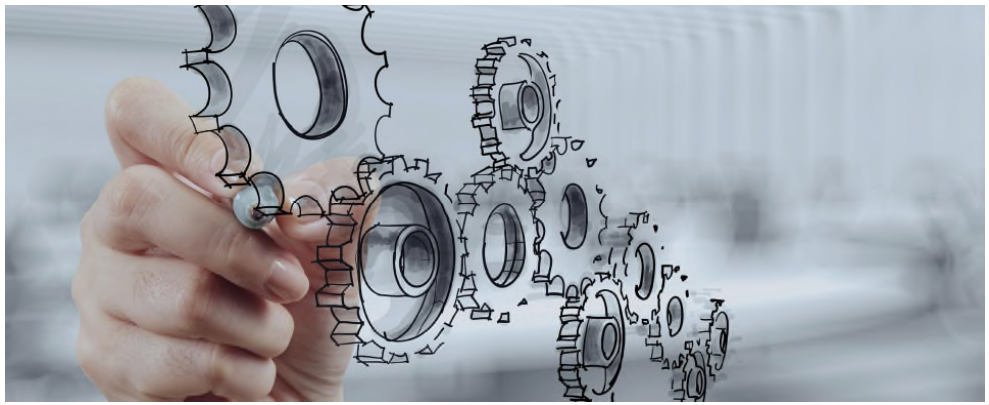
© Manish Parashar and Omer Rana

Autonomic Computing =

Concept for artificially intelligent systems



https://www.colourbox.com



http://astekservices.co.uk

Engineering discipline for building artificially intelligent systems

How do we ***construct*** Autonomic Systems?

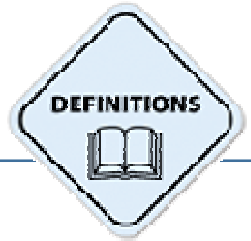
http://freedesignfile.com

We need expertise from many fields:

- Software engineering
- Systems engineering
- Control theory
- Artificial intelligence
- Machine-learning
- Multi-agent systems
- …

Foundation
=
Architecture !

Foundation = Architecture

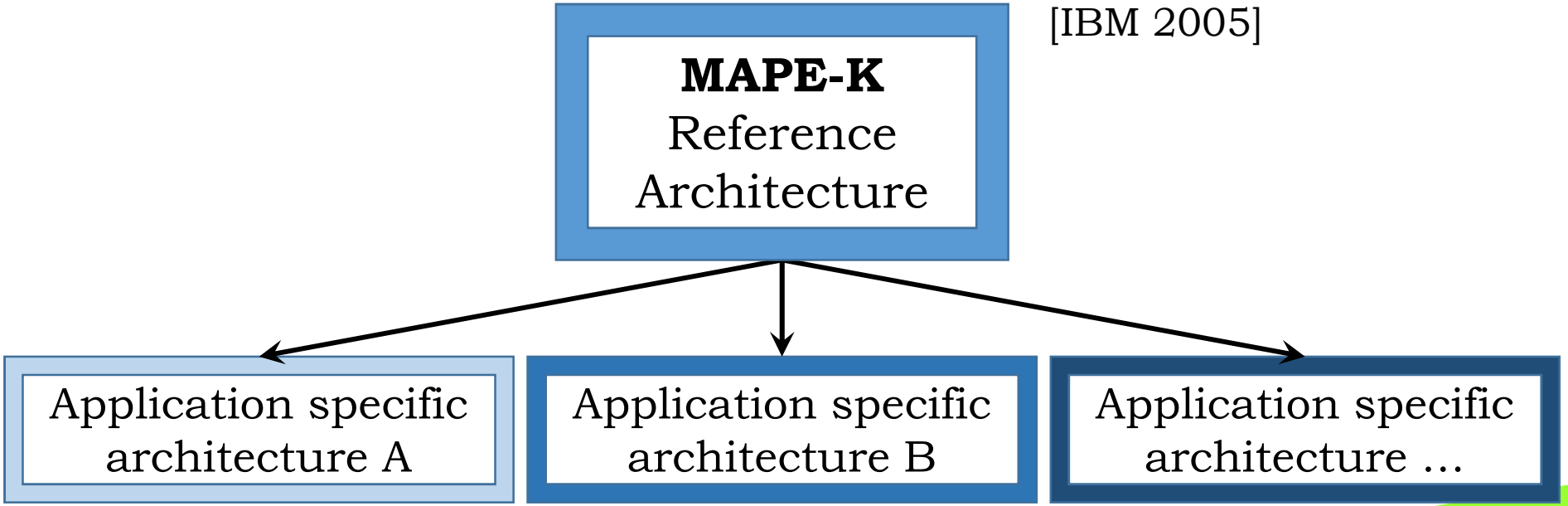


IT Architecture Definition:

"The fundamental *organization* of a system embodied in its *parts*, their *relationships* to each other and to the environment, and the *principles* guiding its design and evolution"

[IEEE]

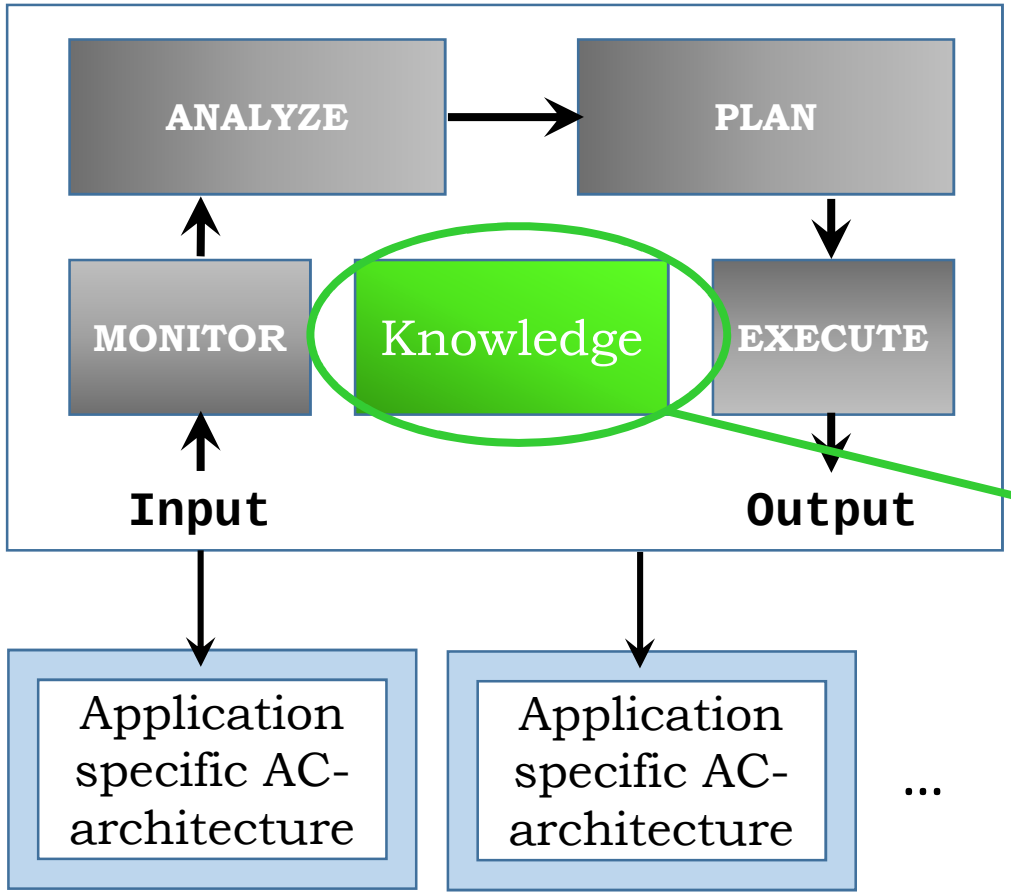
[IBM 2005]



MAPE-K: IBM Reference Architecture

Knowledge

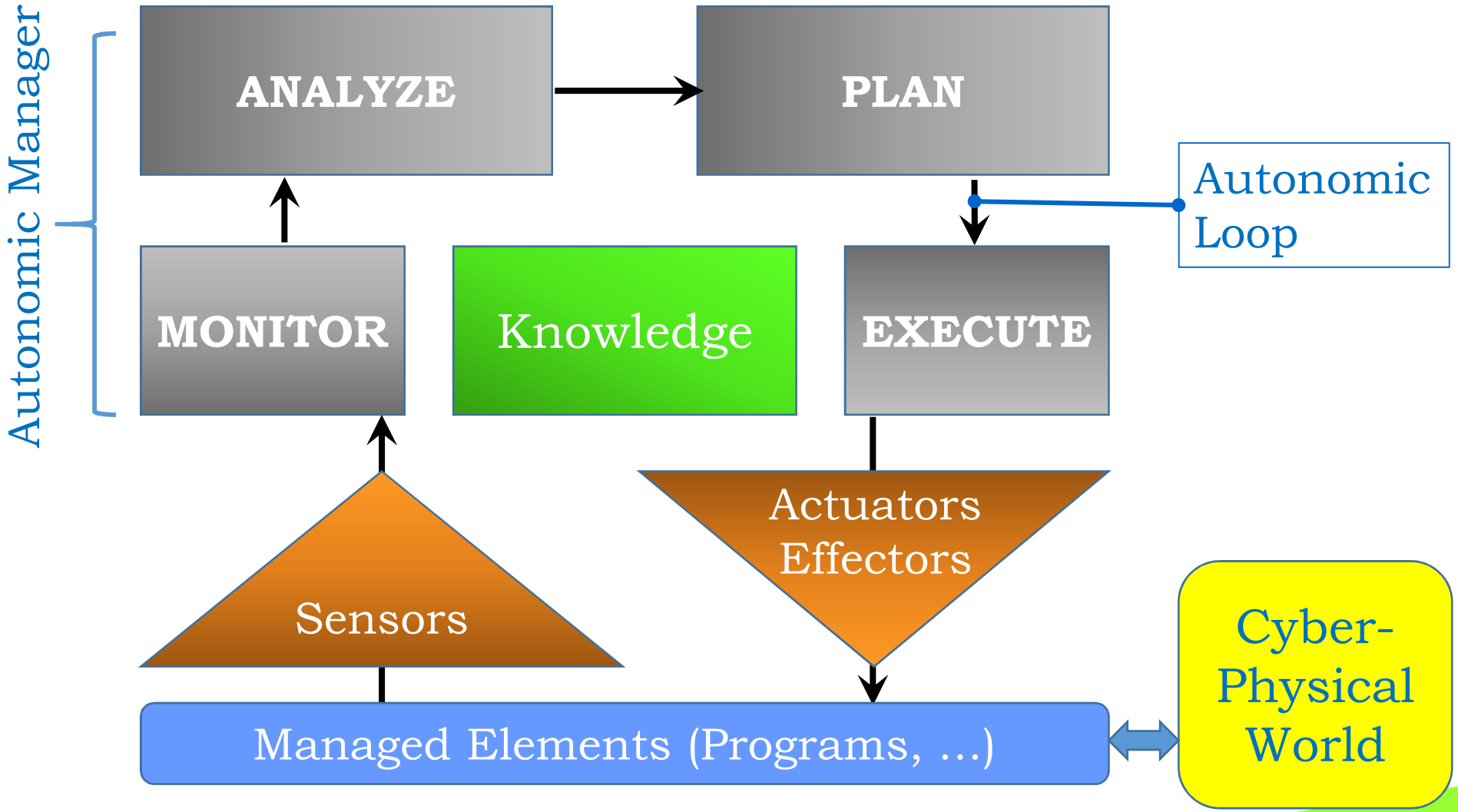
Monitor – **A**nalyze – **P**lan - **E**xecute



Artificial Intelligence Technologies:

- Modeling
- Reasoning
- Data Analysis
- Machine Learning
- Agent systems
- Inference
- Control theory
- …

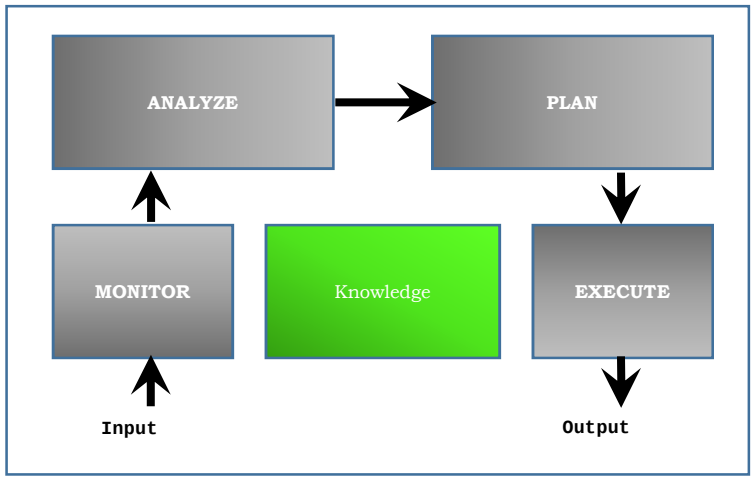
Autonomic System **Reference Architecture**

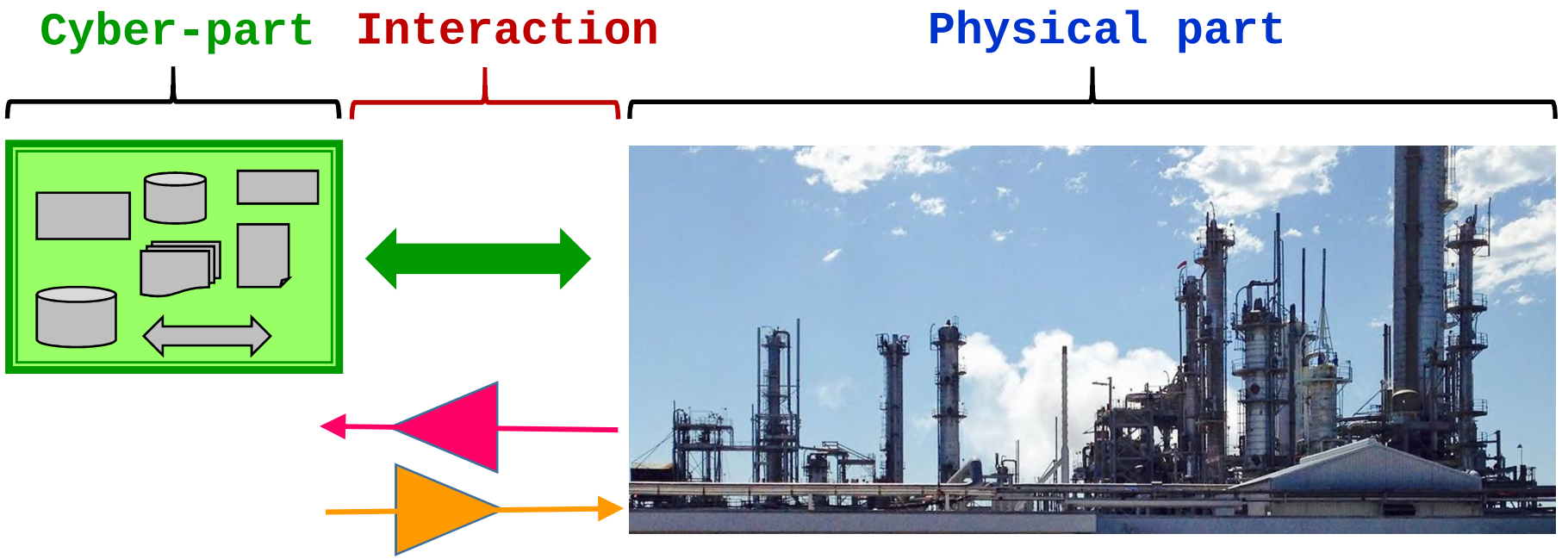


Cyber-Physical System (CPS)

"A ***cyber-physical system*** (CPS) consists of a collection of ***computing devices*** communicating with one another and ***interacting*** with the physical world in a ***feedback loop***"

R. Alur: Principles of Cyber-Physical Systems, 2015



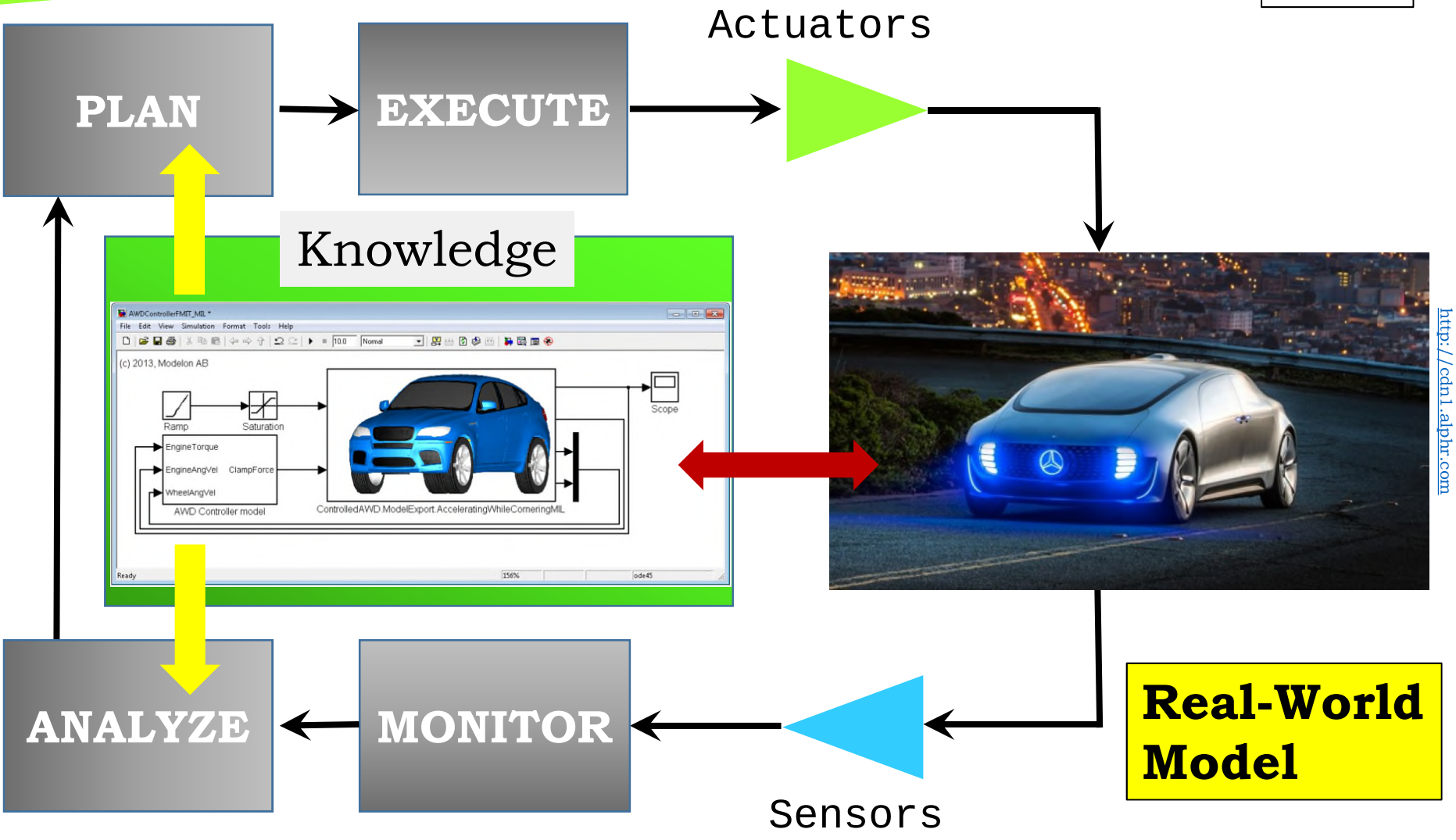


Sensors: Input Signals

Actors: Output Signals

Cyber-physical system

CPS

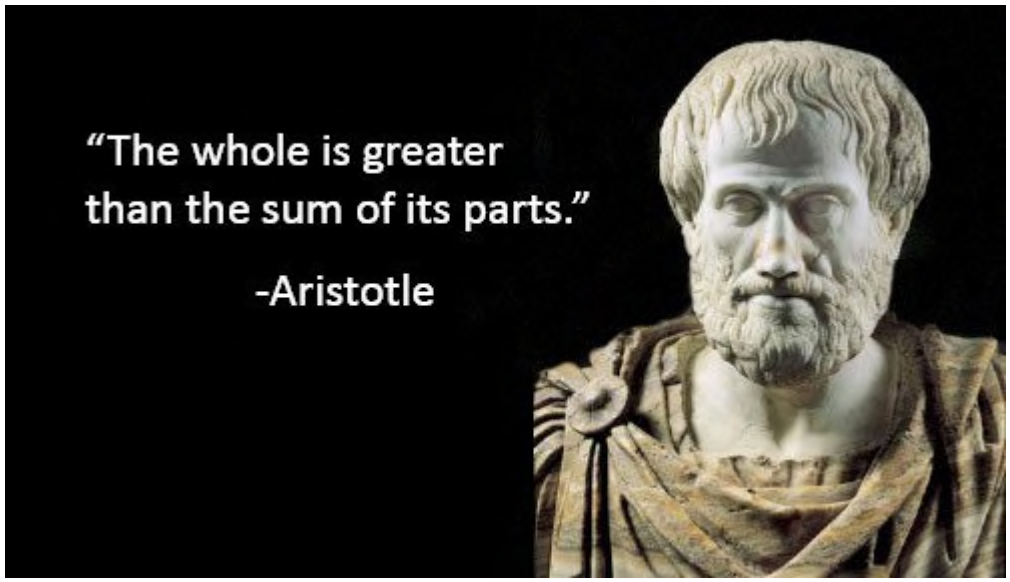


http://www.modelon.com

http://cdn1.alphr.com

CPSoS

"A ***cyber-physical system-of-systems (CPSoS)***
is a ***collaboration*** of dedicated systems
that pool their resources and capabilities
to create a new, ***more complex system***
which offers ***more functionality***
than the sum of the constituent systems"

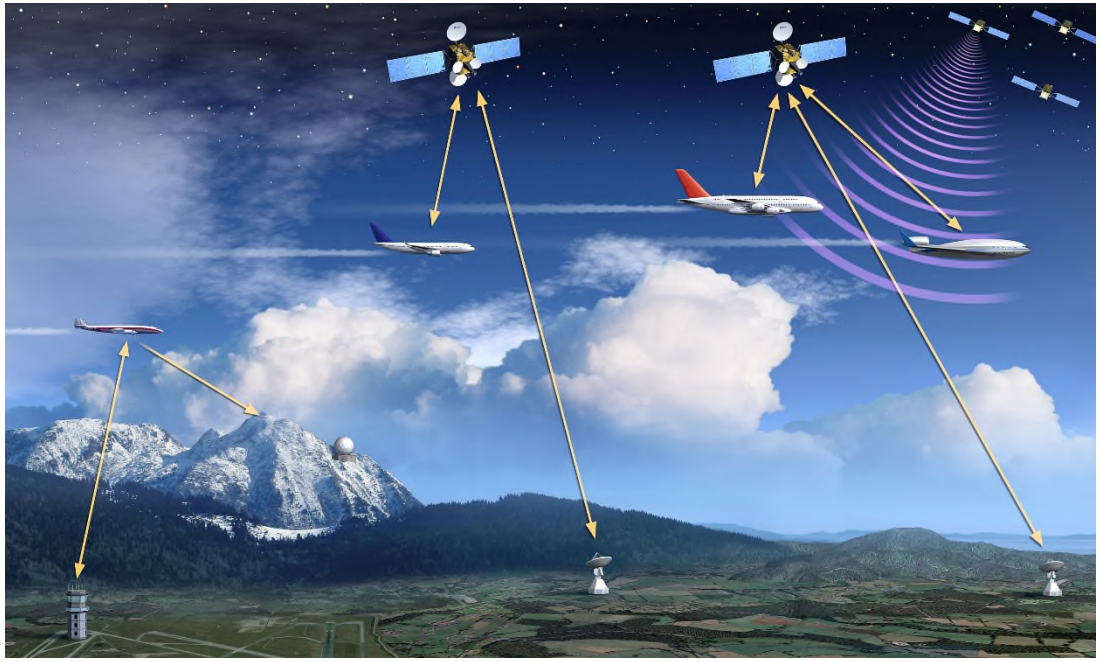


https://media.licdn.com

CPSoS:

Emergent Properties

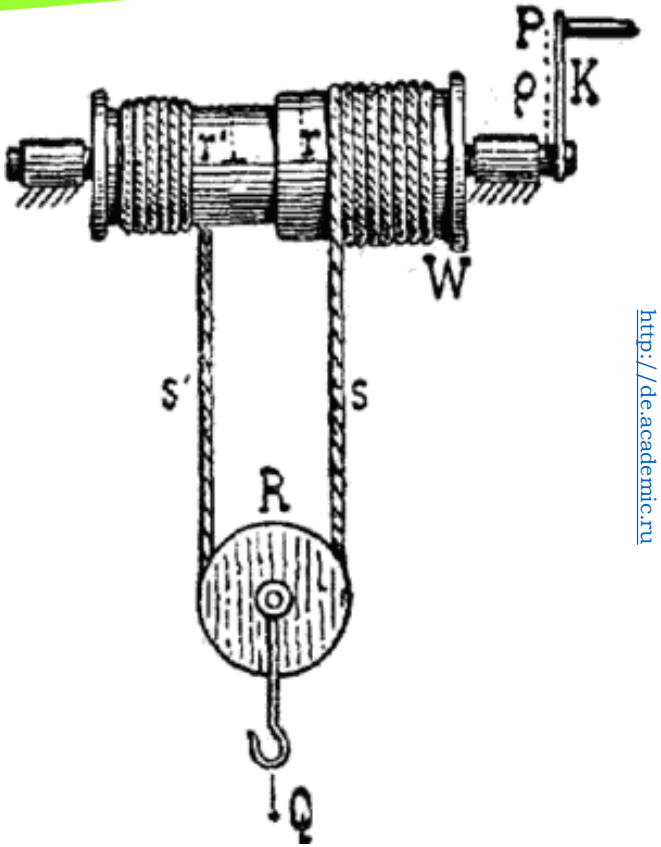
Cyber-Physical Systems-of-Systems (CPSoS)



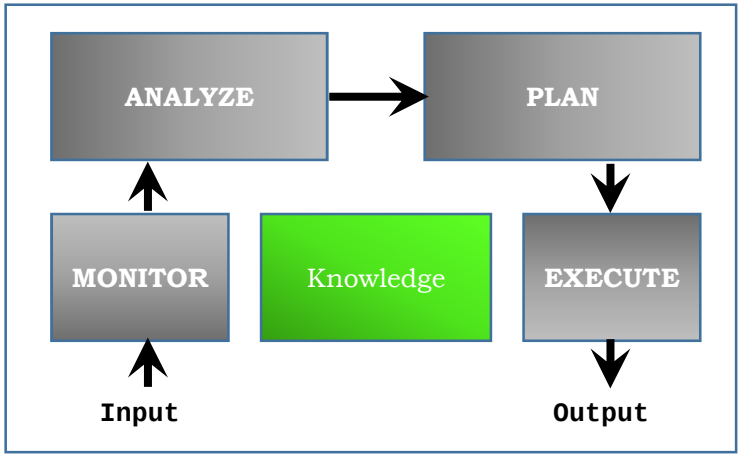
http://www.aero.sbg.ac.at

CPSoS:

Most of today's (and all of tomorrow's?) interesting applications are Cyber-Physical Systems-of-Systems

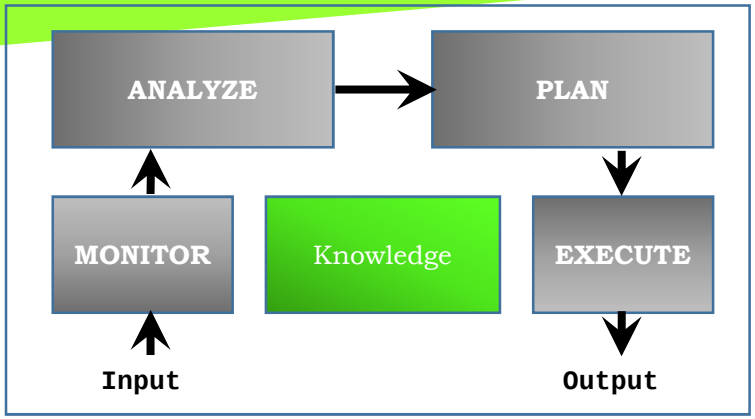


http://de.academic.ru



*… and use **Artificial Intelligence**:*

- Real-time models
- Machine learning
- Reasoning/Inference
- Intelligent agents
- Knowledge representation

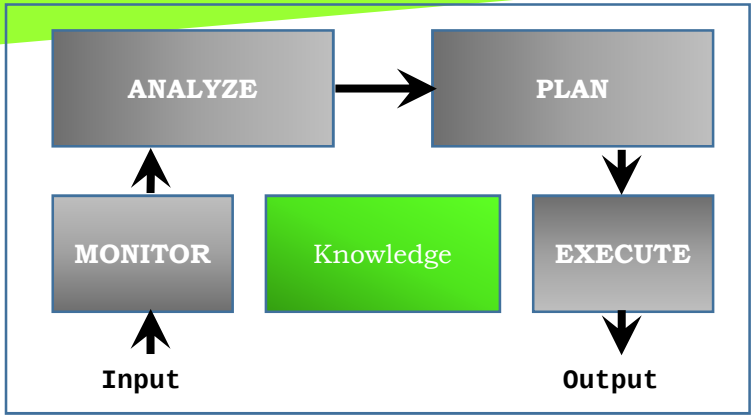


CPSoS Future Applications

Unmanned Ships

http://dsg.files.app.content.prod.s3.amazonaws.com

The large cargo ships will sail unmanned from port to port, including port leave and port entry



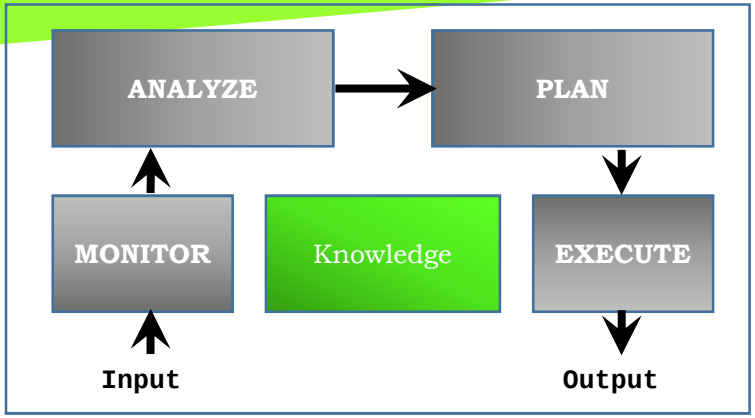
Future Applications (Examples)

Cyber-attack defense

Autonomous, AI-based, preventive cyber-attack detection and defense

http://www.bibliotecapleyades.net

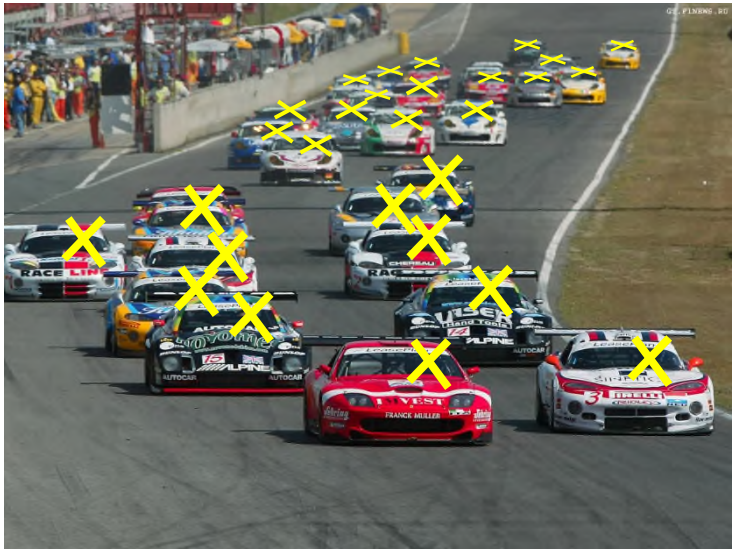
AUTONOMIC COMPUTING



Future Applications (Examples)

Roborace
[Unmanned Automobile Racing]

Fully electric cars, V_{max} = 300 km/h



https://www.crowdact.com

https://wi-images.condecdn.net

24 mechanically identical cars / 12 teams / F1-race circuits / **NO drivers**

Winner: Cognitive and autonomic SW (24-Teraflops-Computers on-board)

Challenge for Autonomic Computing

⇒ the problems:

- are ***not*** fully defined
- the environment is ***uncertain***

http://cbttherapyuk.com

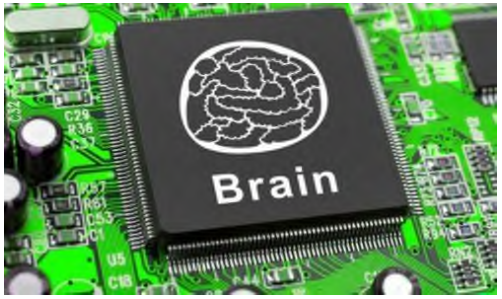
The situations:

- are too ***complex*** to be predicted
- the environment is ***changing*** dynamically

https://s3.amazonaws.com

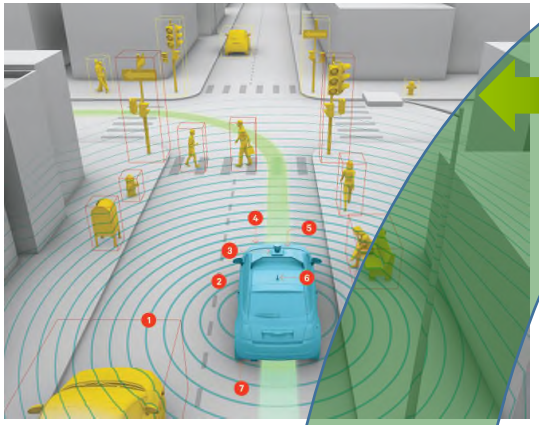
http://wck-grc.com

https://naij-ask.gencdn.com



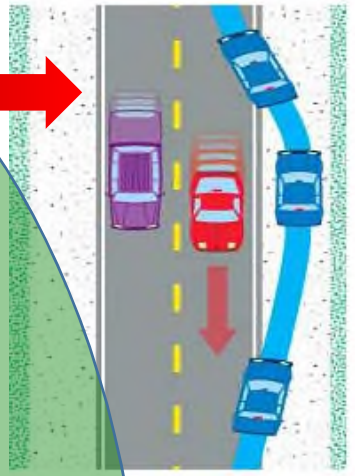
We need the capabilities of **artificial intelligence**

MAPE-K Architecture: (Real-Time) Control Loop

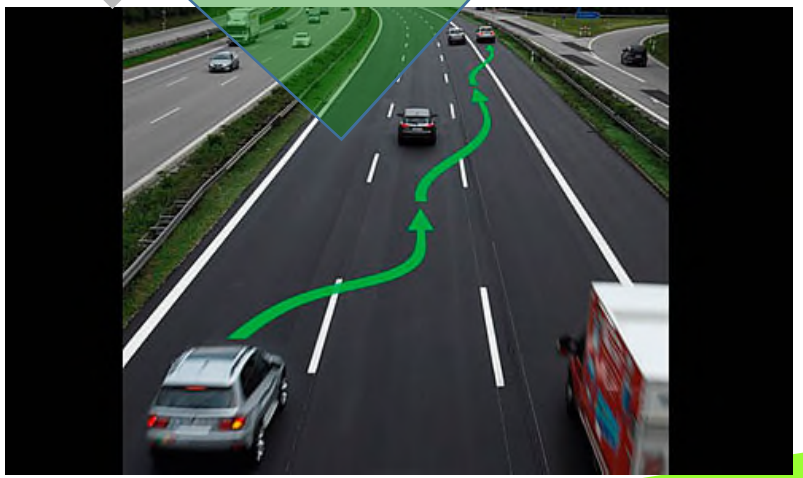


https://www.wired.com

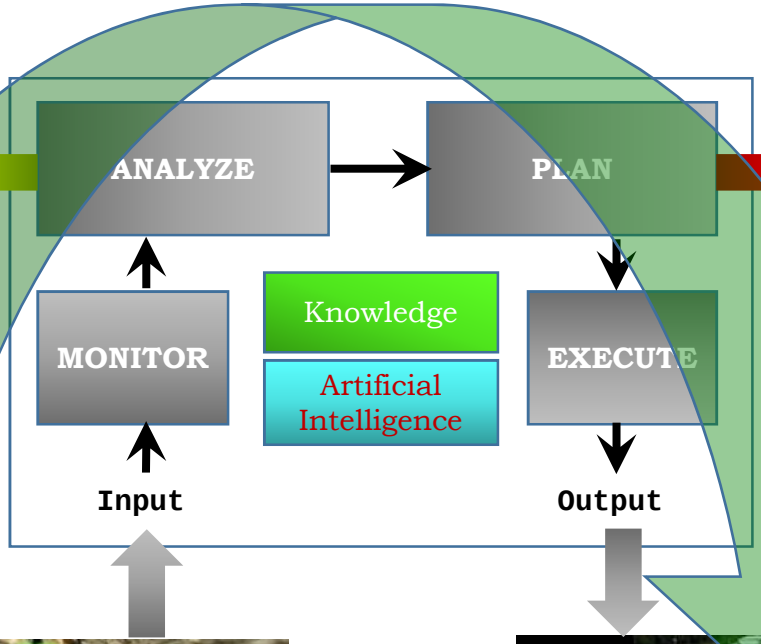
https://www.extremetech.com



https://www.mpi.mb.ca

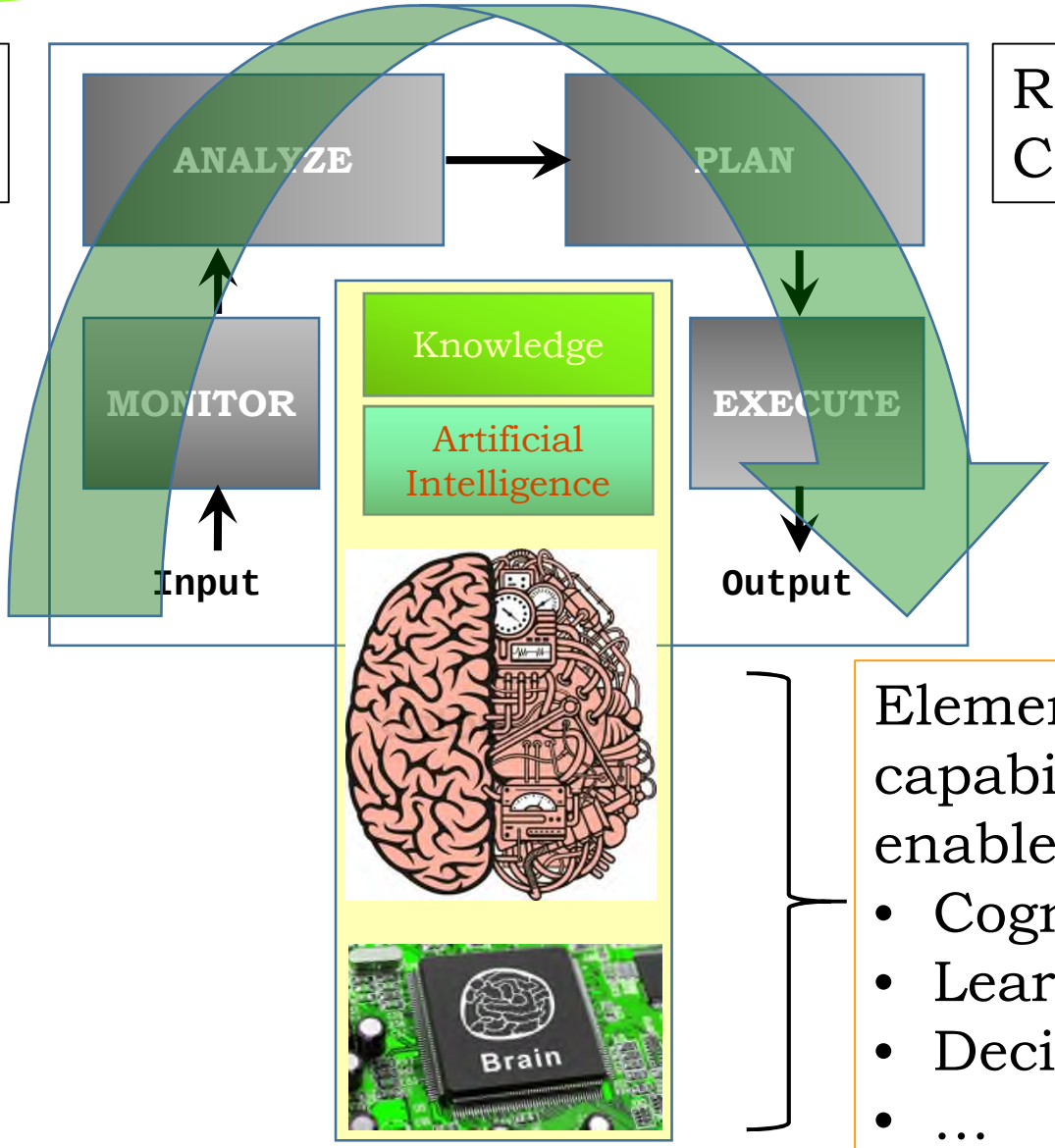


http://2.bp.blogspot.com



AUTONOMIC COMPUTING

MAPE-K Architecture



Real-Time Control Loop

Elements and capabilities which enable:

- Cognition
- Learning
- Decisions
- …

http://de.123rf.com

Part 3: Principles of a good paper

A good paper has:

http://www.florian-ultra.de

- A *valuable* message that will be *remembered*

- A *pleasurable* experience while reading it

http://gibloemfontein.sites.caxton.co.za

Key element = An interesting, consistent and complete **storyline**

Storyline = Logical, seamless sequence of ideas

https://img.clipartfest.com

The reader must be ***guided*** gently and pleasurably through your written material

- Logical and no breaks
- Understandable terminology
- **NO** unnecessary concepts
- Short and concise
- Good language

The **storyline** is a **document** which is written and reviewed ***before*** the first word of the paper is written

http://peccoud.org

A **weak** storyline is a sure reason for:

1. Annoying your reader
2. Get a rejection
3. Loose your reputation

Short, precise, complete outline of sequence and content

Storyline

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

CONTEXT

Individual traffic using trucks and private cars forms an important element of our economy and of our individual life-style.

In the last decades the amount of traffic has increased considerably.

The results are daily congestions and higher accident rates.

They cause significant damage to the economy and to our individual mobility.

http://en.wikipedia.org/wiki/Traffic

Example:

Modern individual traffic

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

What we want to **achieve**

„… how do we see an improved world"

(State [Utopia])

What we want to **do**

„… how do we improve the world"

(Action [Way to …])

http://en.wikipedia.org/wiki/Traffic

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

http://en.wikipedia.org/wiki/Traffic

VISION

The vision is to keep traffic fluid, efficient and with low rates of accidents.

One promising approach is to support – or even replace – the drivers by electronic driving assistance systems.

Clear and comprehensive statement of the long-term goal

⇒ **Vision Statement**

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

http://en.wikipedia.org/wiki/Traffic

MISSION

This paper demonstrates the feasibility and implementation of one important electronic driving assistance system.

We present and discuss the sensor-based collision-avoidance systems.

Many such systems are under development - some of them can even be found in modern production cars.

Our target audience are graduate students in mechanical, electronics and computer science

Precise statement of the work

⇒ **Mission Statement**

self-study

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

FOCUS

Sensor-based collision-avoidance systems are a wide field of research.

It encompasses sensor-, software-, image processing- and safety engineering.

We focus on one specific system: The system developped by Mercedes-Benz which can be found in most of their current production cars.

We explain its architecture, functionality, features and limitations.

http://en.wikipedia.org/wiki/Traffic

self-study

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

Restrict, restrict, restrict !

Organize, organize, organize !

Avoid all unnecessary concepts.

Establish a clear state-of-the-art, of prior work and of relevant references

http://en.wikipedia.org/wiki/Traffic

self-study

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

This paper has demonstrated the great value of collision-avoidance systems.

Such systems could greatly be improved by using real-time environmental information.

Therefore, research should continue into car-to-car and car-to-infrastructure communications

http://en.wikipedia.org/wiki/Traffic

Storyline:

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

My contribution was to explain the current collision avoidance system in the form of a tutorial for engineering students

In addition I have shown the impact of the system on the avoidance of accidents

http://en.wikipedia.org/wiki/Traffic

1

Storyline

- Context
- Vision
- Mission
- Focus
- Material/body
- Message
- My contribution

2

Paper

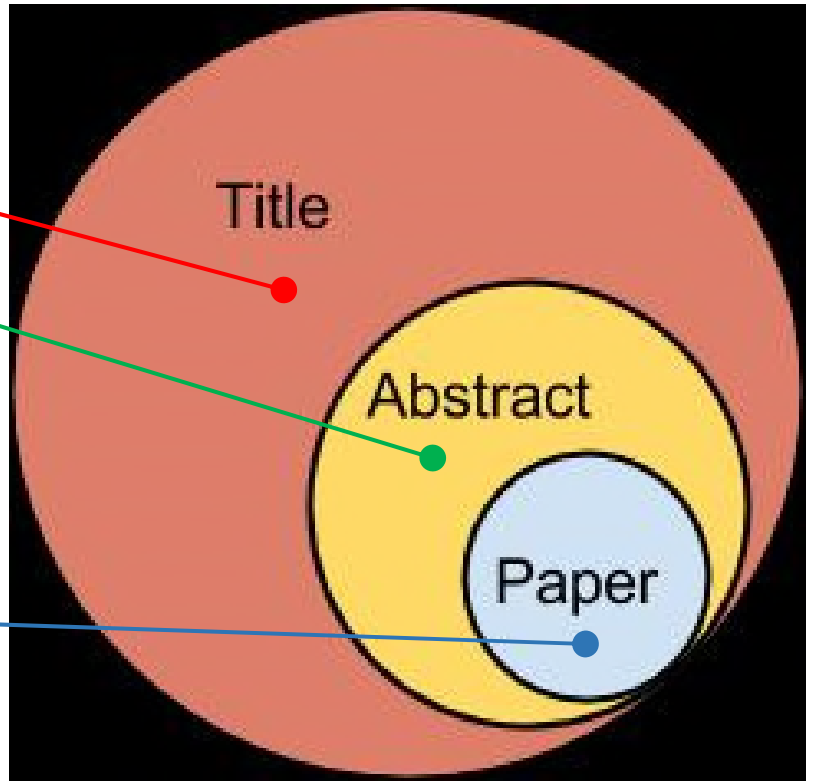
- Title
- Abstract/summary
- Introduction
- Existing work, state-of-the-art
- Chapters
- Our/my contribution
- Conclusions, Recommendations
- Acknowlegments, ©
- References

https://1.bp.blogspot.com

Paper

- Title
- Abstract/summary
- Introduction
- Existing work, state-of-the-art
- Chapters
- Our/my contribution
- Conclusions, Recommendations
- Acknowlegments, ©
- References

Reader Attention:



http://blogs.nature.com

Typical structure of a good paper

Style

self-study

The **content** of your paper is:

- correct
- precise
- clear
- brief
- ethical

Your material must be free from error and in accordance with facts

If it is vague, it is not scientific writing

If it is unclear or ambiguous, it is not scientific writing either

If it is long-winded and unnecessarily discursive, it is poor scientific writing

Fair, truthful, respectful, references, copyrights, …

self-study

- precise
- clear

Importance of definition of terms

Many terms are highly ambiguous, context-dependent, author-dependent, time-dependent etc.

`System, element, module, component, domain, …`

Term „Human“ [Definition]:

We are bilaterally, symmetrical, sexually differentiated bipeds located on one of the outer spirals of the Milky Way, capable of recognising the prime numbers …

[NASA Deep Space Probe]

self-study

- brief

Clear is more important than brief

Acronyms and abbreviations are poison for the reader

⇒ Avoid them (whenever possible)

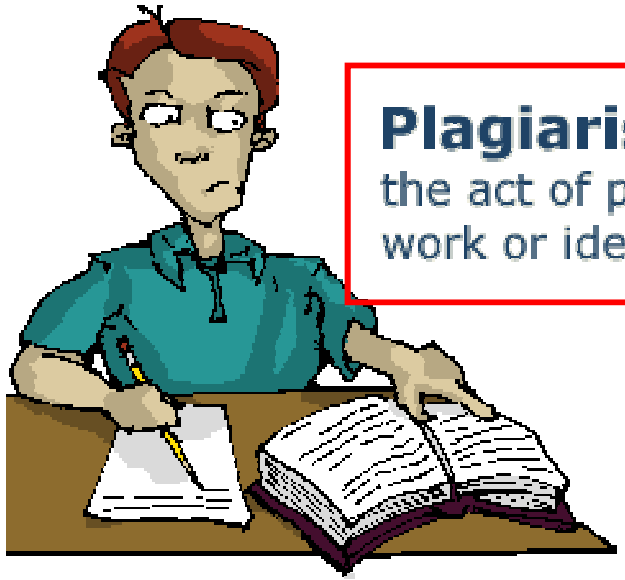
If necessary, introduce them (1x or 2x) at the beginning:

„This paper introduces the concept of System-of-Systems (SoS)“.

An SoS …

The vehicle can be seen as an SoS, with many CS, such as ABS, ESC, BA and possibly a CAS.

https://spicyip.com



Plagiarism:
the act of presenting another's work or ideas as your own.

Intended Plagiarism
- **Willfully** done!

Unintended Plagiarism
- **Carelessly** done!

- Completely list **all** your references
- Carefully give credit to other authors
- Mark citations
- Add copyright notice (© xyz)
- Respect commercial rights

https://pbs.twimg.com

Language

Use a spell checker!
https://www.grammarly.com
http://www.whitesmoke.com/
etc.

Versioning

Version all your documents!

Version	Date	Author(s)	Changes
0.1	13.2.17	Frank J. Furrer	Initial Draft
0.2	9.4.17	Hans Muster	Review + Additions

File Name:
`HS17Paper_HansMuster_V03_20170410`

http://dailygrail.com

Part 4: Principles of a good presentation

https://violentmetaphors.files.wordpress.com

What is the ***difference*** between a good paper and a convincing presentation?

https://sarahzaki.files.wordpress.com

… same basic principles √

+

Pictures/Illustrations

Animations

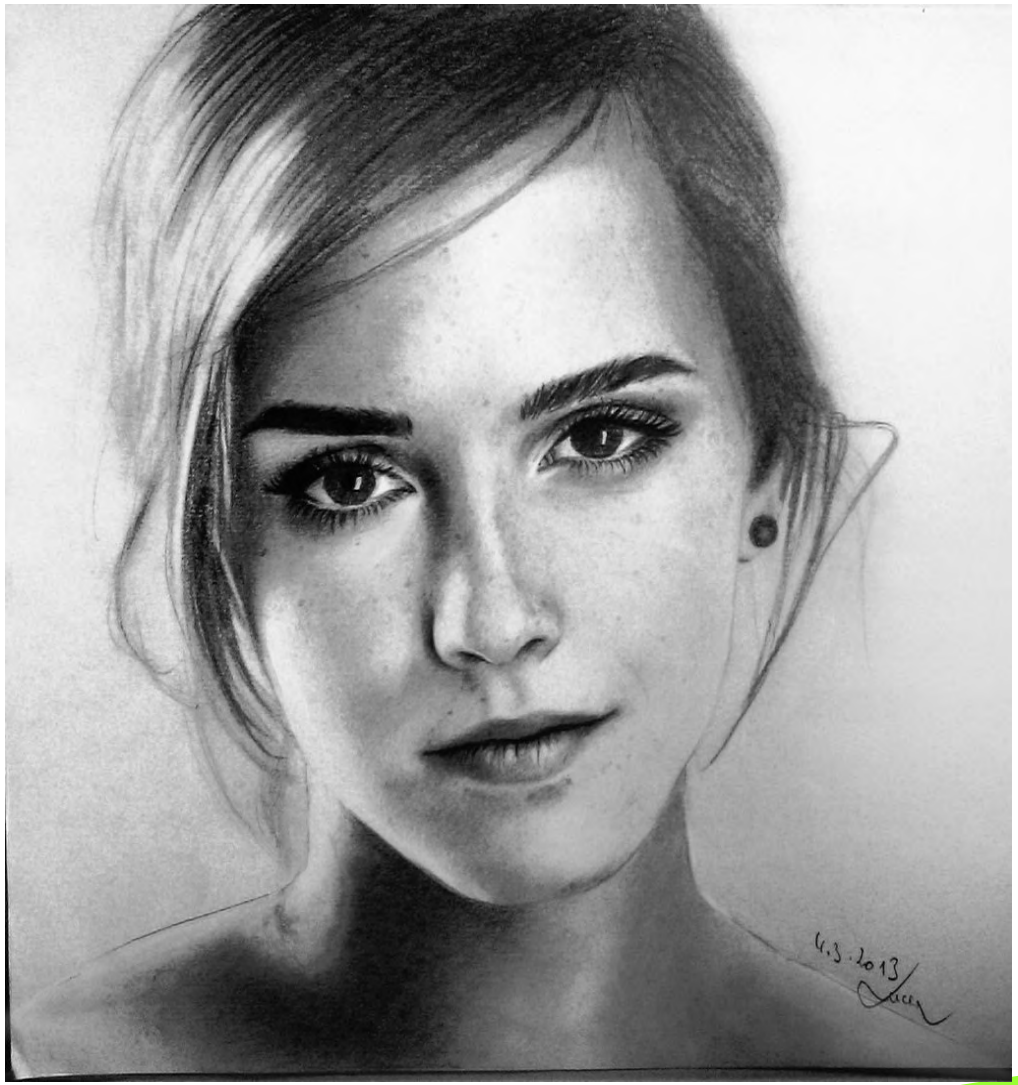
Personal style

More expressiveness

Paper ⇔ Presentation ?

- Illustrations/pictures
- Animations
- Personal style

- emotion
- feeling
- provocation



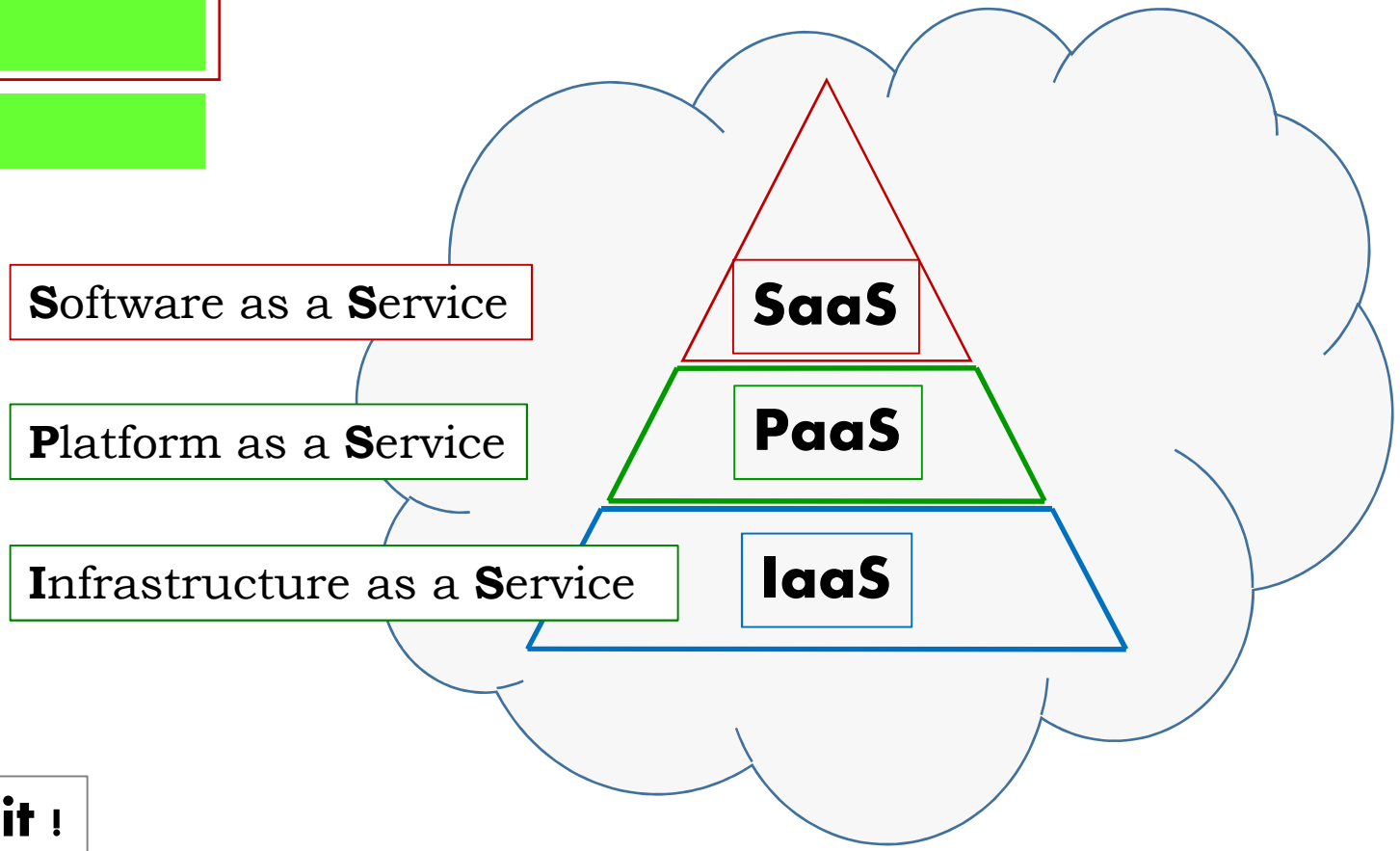
http://www.thanod.com

Illustrations/pictures

Animations

Personal style

Cloud Definitions:



Don't overdo it !

Illustrations/pictures

Animations

Personal style

- relate to your audience
- be highly present
- be strongly engaged

http://dailygrail.com

Specific principle 1: **Understand** your audience

Background ?

Prior Knowledge ?

Expectations ?

Reason for attendance ?

http://www.englishandculture.com

Tailor your presentation
to the background and needs
of your audience

Specific principle 2: **Key Message**

What is your message ?

Why is it important ?

What does it mean to your audience ?

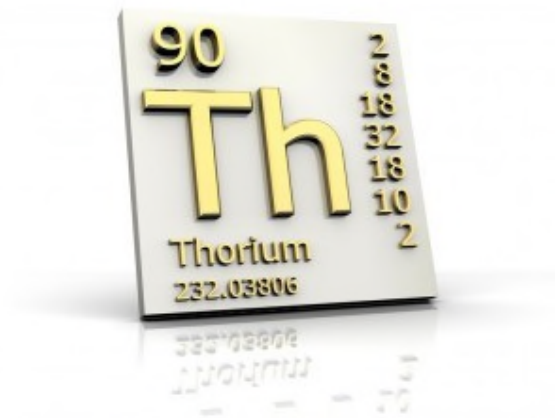
What do you want them to remember ?

http://www.mediafane.com

The key message is the continuous focus of your presentation

self-study

Example: Thorium Nuclear Energy



Audience: YOU!

- *Background*: mathematical-physical-engineering education
- *Prior knowledge*: basic nuclear physics
- *Expectations*: Possible solution to world's energy problem?
- *Reason for attendance*: critical assessment, gain of knowledge

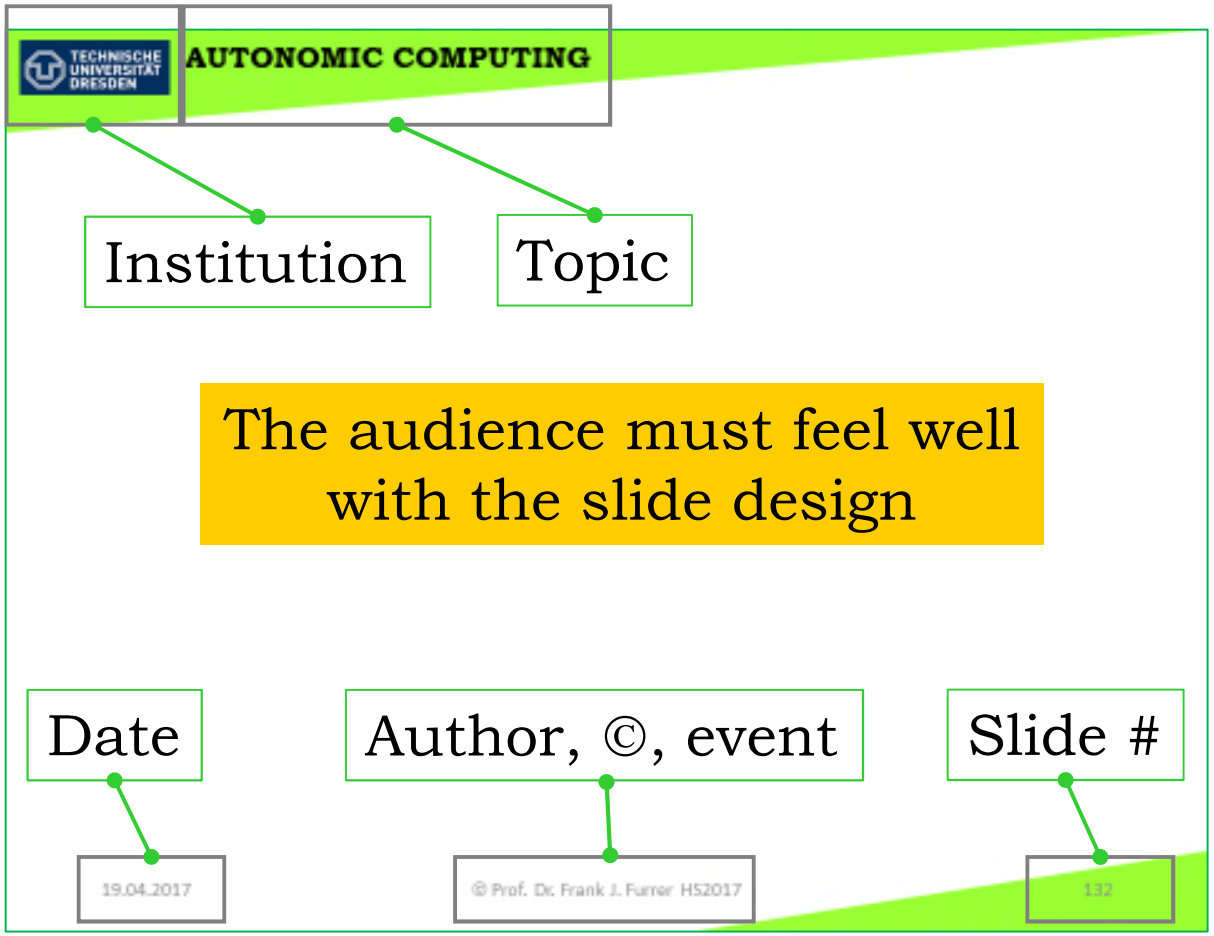
Key message:

«THORIUM – The Green Energy Source of the Future»

Richard Martin: **Superfuel – *Thorium, the green energy source of the future***.
Palgrave McMillan Publishers, New York, USA, 2012. ISBN 978-0-230-11647-4

Slide Structure: Orientation

Slide design



Elements of a bad presentation:

- Small (< 22 pt) or unreadable fonts
- Too dense slides
- Few illustrations, pictures
- Excessive animations
- (Extensive) use of bullet point lists
- Unclear message, bad storyline
- Introduction of superfluous concepts
- … and some more

Garr Reynolds: **Presentation ZEN** – ***Simple Ideas on Presentation Design and Delivery.***

New Riders Publishing, Berkeley CA, USA, 2008. ISBN 978-0-321-52565-9

Elements of a bad presentation:

- Small (<
- Too
- Few
- Exce
- (Ext
- Uncl
- Intr
- … ar

http://img.galerie.chip.de

Garr Reynolds:

New Riders Publishing, Berkeley CA, USA, 2008. ISBN 978 0 321 52565 9

What is the sure **death** of a good presentation ?

http://www.wfs.org

http://hqwallbase.pw/82449-a-step-forward/

Next Steps

Hauptseminar limited to **7** participants

Please send an e-mail to: frank.j.furrer@bluewin.ch
confirming your participation and state:

1. Full name
2. Studiengang
3. In which term did you attend the FPS-lecture?
4. Reason for attending the HS
5. Committment to:
   - attend all 3 dates
   - deliver the requested paper
   - hold two presentations

Latest Saturday, April 22, 2016 – Thank you

HS Schedule Part 1

Hauptseminar Kick-Off Meeting	**Wednesday, April 19, 2017: 11:10 – 12:40 (3. DS)** **Room APB/INF 2101**	Introductory Lecture by Prof. Frank J. Furrer
Select 2 **peer reviewers** from the participants Note: **All** papers will also be reviewed by Dr. F.J. Furrer (as 3rd peer reviewer)	Monday, April 24, 2017	e-mail your choice to: • All participants • frank.j.furrer@bluewin.ch
Deliver your **choice of working field** (i.e. **F1**, **F2** or **F3**) and a short **vision/mission statement** to the 2 peer reviewers and to F.J. Furrer Note: Content and structure of the "vision/mission statement" will be explained in the Kick-Off Meeting	Friday, April 28, 2017	e-mail your choice to: • All participants • frank.j.furrer@bluewin.ch
Feedback from Reviewers	Friday, May 5, 2017	By e-mail from: • The peer reviewers • frank.j.furrer@bluewin.ch
Deliver 1st draft of both your storyline and your paper to your peer reviewers Note: Content and structure of the "storyline" and "paper" will be explained in the Kick-Off Meeting	Friday, May 19, 2017	e-mail your storyline and paper: • Peer reviewers • frank.j.furrer@bluewin.ch
Feedback from Reviewers	Friday, May 26, 2017	By e-mail from: • The peer reviewers • frank.j.furrer@bluewin.ch

2 documents

Work Methodology

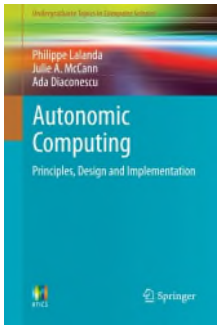
Acquire necessary domain knowledge

Choose working field [F1, F2 or F3]

Literature research [⇒ State of the Art]

Define your own contribution

Produce paper & presentations



Mandatory Reading

F1: **Historical development**
F2: **Autonomic computing technologies**
F3: **Promising applications**

Anleitung:
Dr. B. Demuth

http://sr.photos1.fotosearch.com

Prof. h.c. Dr. sc. techn. ETH-Z
Frank J. Furrer

Contact Details:

frank.j.furrer@bluewin.ch
frank.furrer@mailbox.tu-dresden.de

https://cdn.shutterstock.com

References

Agoulmine10	Nazim Agoulmine (Editor): **Autonomic Network Management Principles – *From Concepts to Applications*** Academic Press, Burlington, MA, USA, 2010. ISBN 978-0-12-382190-4
Ardagna10	Danilo Ardagna, Li Zhang (Editors): **Run-time Models for Self-managing Systems and Applications** Birkhäuser-Verlag (Springer), Basel, Switzerland, 2010. ISBN 978-3-0346-0432-1
Babaoglu05	Ozalp Babaoglu, Márk Jelasity, Alberto Montresor, Christof Fetzer, Stefano Leonardi, Aad van Moorsel, Maarten van Steen (Editors): **Self-star Properties in Complex Information Systems** Springer Lecture Notes in Computer Science, Volume 3460, 2005. ISBN: 978-3-540-26009-7
Cong-Vinh11	Phan Cong-Vinh (Editor): **Formal and Practical Aspects of Autonomic Computing and Networking – *Specification, Development, and Verification*** Premier Reference Source, Information Science Reference Publishing, 2011. ISBN 978-1-60960-845-3
DARPA15	Defense Advanced Research Projects Agency (DARPA): ***2016 DARPA Cyber Grand Challenge Final Competition – The World's First All Machine Hacking Tournament*** Downloadable from: http://www.darpa.mil/news-events/2015-07-08 / https://cgc.darpa.mil/ [last accessed 15.3.2016]
DARPA16	Defense Advanced Research Projects Agency (DARPA): ***DARPA Cyber Grand Challenge Competitor Portal***. 2016 Downloadable from: https://cgc.darpa.mil/ [last accessed 15.3.2016]

AUTONOMIC COMPUTING

Dobson10	Simon Dobson, Roy Sterritt, Paddy Nixon, Mike Hinchey: ***Fulfilling the Vision of Autonomic Computing***. IEEE Computer Society, January 2010. Downloadable from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.376.1739&rep=rep1&type=pdf [last accessed 12.3.2016]
Fortes11	José Fortes (Director of the US National Science Foundation's Center for Autonomic Computing): ***What is autonomic computing?*** Interview, January 26, 2011. Downloadable from: https://sciencenode.org/feature/what-autonomic-computing.php [last accessed 9.4.2016]
GrammaTech16	GrammaTech, Inc., Ithaca, NY 14850: ***Autonomic Computing – Powering the Industry's Future Intelligent Devices.*** Downloadable from: http://www.grammatech.com/autonomic-computing [last accessed 15.3.2016]
Hariri06	Salim Hariri, Manish Parashar (Editors): **Autonomic Computing - *Concepts, Infrastructure, and Applications*** CRC Press Inc., Boca Raton, USA, 2006. ISBN 978-0849393679
Hildebrandt11	Mireille Hildebrandt, Antoinette Rouvroy: **Law, Human Agency and Autonomic Computing – *The Philosophy of Law meets the Philosophy of Technology*** Routledge (Taylor & Francis), Milton Park, UK, 2011. ISBN 978-0-415-72015-1
Huebscher08	Markus C. Huebscher, Julie A. McCann: ***A survey of Autonomic Computing — Degrees,*** ***models and applications***. ACM Computing Surveys (CSUR) Surveys Homepage archive, Volume 40 Issue 3, August 2008. Downloadable from: https://spiral.imperial.ac.uk/bitstream/10044/1/5738/1/autonomic-computing.pdf [last accessed 19.3.2016]

AUTONOMIC COMPUTING

IBM06	IBM Business Consulting Services: **An Architectural Blueprint for Autonomic Computing** IBM Autonomic Computing, 4th edition, June 2006. Downloadable from: http://www-01.ibm.com/software/tivoli/autonomic/
ICCAC16	2016 IEEE ***International Conference on Cloud and Autonomic Computing*** (ICCAC). Augsburg, Germany, September 12-16, 2016 (see also "history"). http://www.autonomic-conference.org/
IJAC16	International Journal of Autonomic Computing (IJAC): http://www.inderscience.com/jhome.php?jcode=ijac
Kurian13	Devasia Kurian, Pethuru Raj: ***Autonomic Computing for Business Applications*** (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 8, 2013. Downloadable from: http://thesai.org/Downloads/Volume4No8/Paper_1-Autonomic_Computing_for_Business_Applications.pdf [last accessed 9.4.2016]
Lalanda13	Philippe Lalanda, Julie A. McCann, Ada Diaconescu: **Autonomic Computing – *Principles, Design and Implementation*** Springer-Verlag, London, 2013. ISBN 978-1-4471-5006-0
Menasce07	Daniel A. Menascé, Jeffrey O. Kephart: ***Autonomic Computing*** IEEE Computer Society, January/February 2007. Downloadable from: https://www.computer.org/csdl/mags/ic/2007/01/w1018.pdf [last accessed 9.4.2016]
Müller06	Hausi A. Müller, Liam O'Brien, Mark Klein, Bill Wood: ***Autonomic Computing*** Carnegie Mellon University, Technical Note CMU/SEI-2006-TN-006, 2006. Downloadable from: http://www.sei.cmu.edu/reports/06tn006.pdf [last accessed 14.1.2016]

AUTONOMIC COMPUTING

Murch04	Richard Murch: **Autonomic Computing** IBM Press, Prentice Hall PTR, NJ, USA, 2004. ISBN 978-0-13-315319-3
Parashar06	Manish Parashar, Salim Hariri (Editors): **Autonomic Computing - *Concepts, Infrastructure, and Applications*** CRC Press Inc., Boca Raton, USA, 2006. ISBN 978-0849393679
Rak15	Jacek Rak: **Resilient Routing in Communication Networks** Springer International Publishing, Switzerland, 2015. ISBN 978-3-319-22332-2
SciAm02	W. Wayt Gibbs: ***Autonomic Computing – Programs crash, people make mistakes, networks grow and change. That¿s life, and computer scientists are finally building systems that can deal with it*** Scientific American, May 2002. Downloadable from: http://www.scientificamerican.com/article/autonomic-computing/ [last accessed 9.4.2016]
Tianfielda04	Huaglory Tianfielda, Rainer Unland: ***Towards autonomic computing systems*** Engineering Applications of Artificial Intelligence 17 (2004), 689–699 Downloadable from: https://www.researchgate.net/profile/Rainer_Unland3/publication/222433987_Towards_autonomic_computing_systems/links/00b7d51d039fb794b1000000.pdf [last accessed 5.4.2016]
Tschudin07	Christian Tschudin, Christophe Jelger, Lidia Yamamoto: ***Autonomic Computer Systems CS321: IBM's "autonomic computing" initiative, Self-Star, Control Loops, Policies.*** ETHZ lecture, January 15, 2007. Downloadable from: http://www.csg.ethz.ch/education/lectures/ATCN/ws06_07/doc/tschudin-ethz-autonomic1-2up.pdf [last accessed 9.4.2016]
TTU16	***Cloud and Autonomic Computing Center*** Texas Technical University (TTU) http://www.depts.ttu.edu/cac/