

Big data, cloud and machine learning and their impact to education

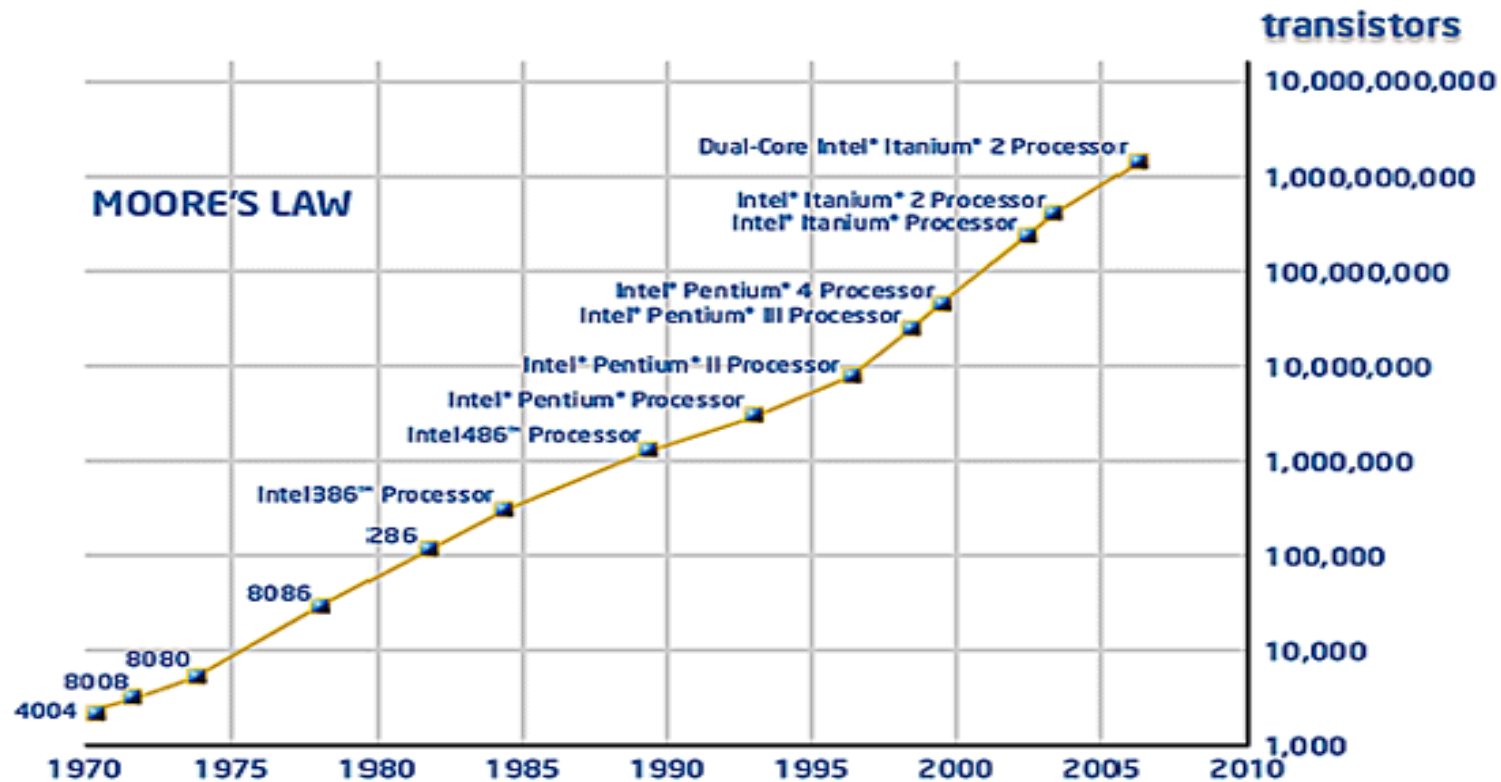


Ass. Prof. Blagoj Delipetrev
Faculty of Computer Science
University Goce Delcev
Shtip, Republic of Macedonia



Moore law (1965)

Observation that the number of transistors in a dense integrated circuit doubles approximately every two years. [Gordon Moore](#), the co-founder of [Fairchild Semiconductor](#) and [Intel](#).



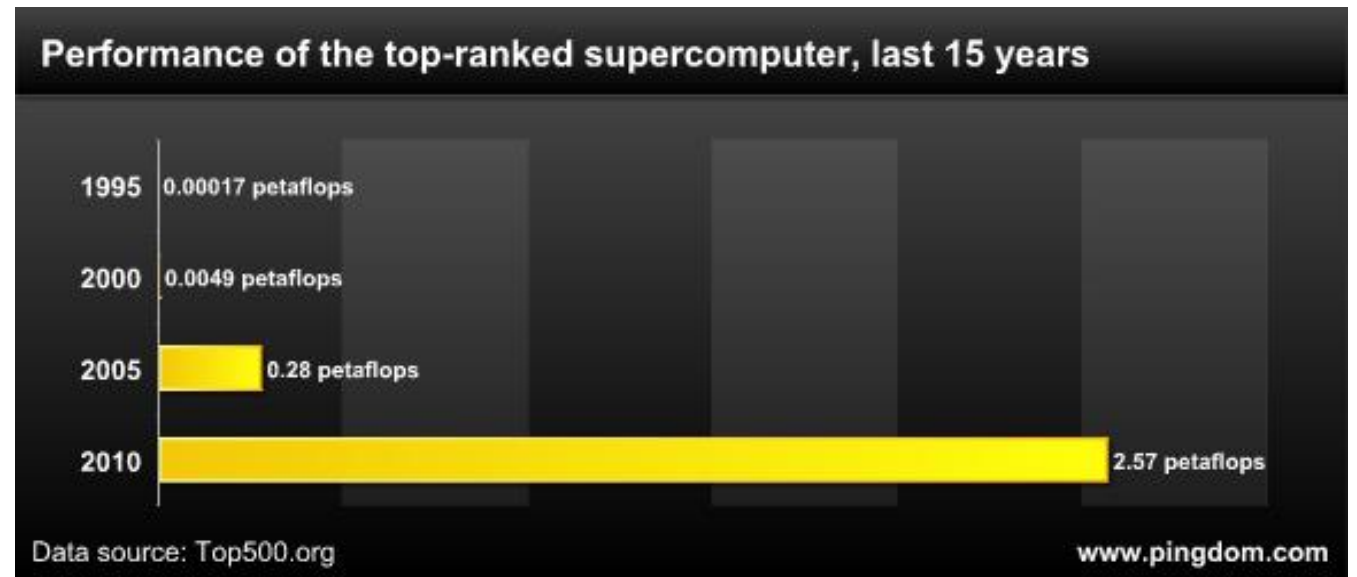
Exponential growth



Supercomputers

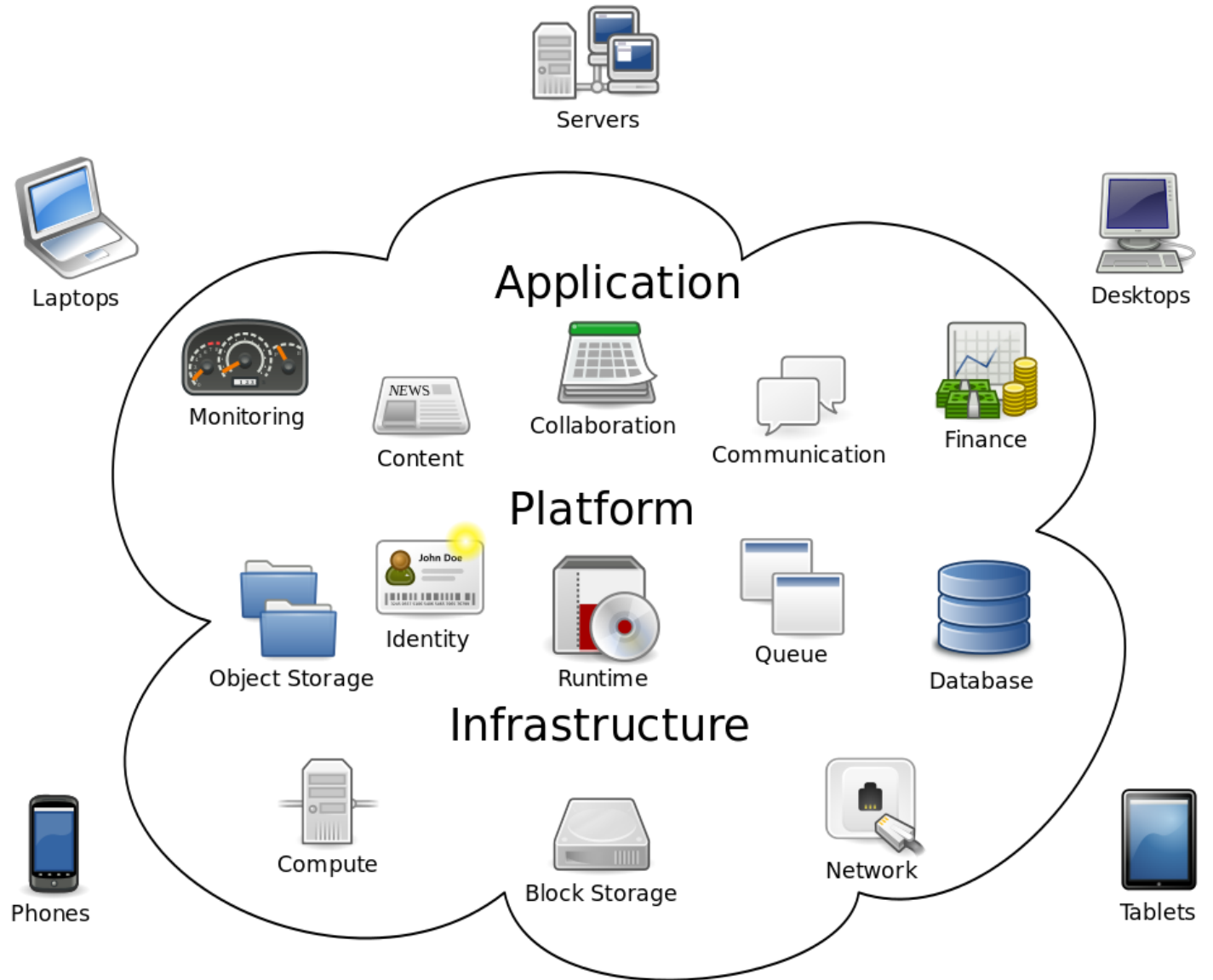
- 2010: 2.57 petaflops
 - 2005: 280.6 teraflops
 - 2000: 4.94 teraflops
 - 1995: 170 gigaflops
- 15,100 times faster
 - 1,650 times faster
 - 19 times faster
 - The baseline

June 2016, the fastest supercomputer in the world is the Sunway TaihuLight, in mainland China, with **Linpack** benchmark of **93 PFLOPS**, exceeding the previous record holder, Tianhe-2, by around 59 PFLOPS.



Cloud

- Next evolution step in ICT
- IASS, PAAS, SAAS
- Amazon idea, why not provide their servers to anyone
- Google and Microsoft main competitors
- Price of computing and data storage going exponentially down
- Perfect for new apps (especially start ups)
- Everything will be in the cloud



Cloud computing

Big data, cloud and machine learning and their impact to education

Blagoj Delipetrev



Big Data

- Consequence of ICT exponential growth
- The data volumes are exploding, [more data](#) has been created in the past two years than in the entire previous history of the human race.
- Within five years there will be over [50 billion smart connected devices](#) in the world, all developed to collect, analyze and share data. (IoT)
- No-SQL databases rise
- **(volume, variety and velocity) 3V's**

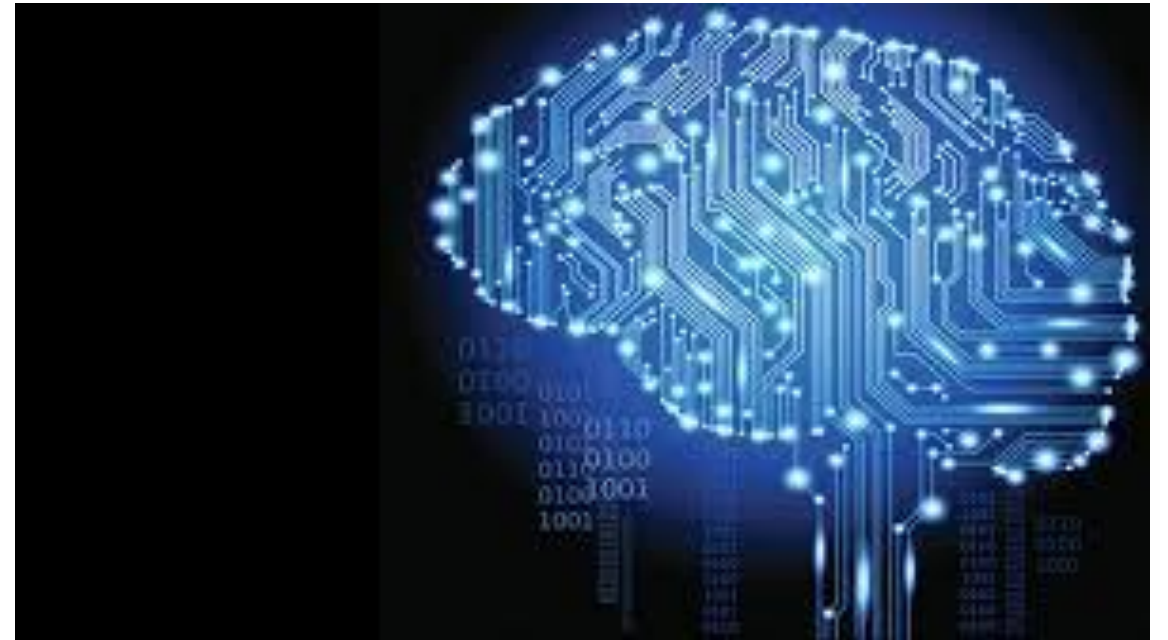
According to computer giant IBM, 2.5 exabytes - that's 2.5 billion gigabytes (GB) - of **data** was generated every day in 2012

<http://www.forbes.com/sites/bernardmarr/2015/09/30/big-data-20-mind-boggling-facts-everyone-must-read/#589d48ce6c1d>



Artificial intelligence and Machine learning

- Main ingredients cloud computing & big data
- Breakthroughs in AI and ML
- 1997 Big Blue won Garry Kasparov
- 2011 Watson won Jeopardy (NLP)
- Autonomous driving (Google, Uber, Tesla)
- 2016 Go - human *AlphaGo*



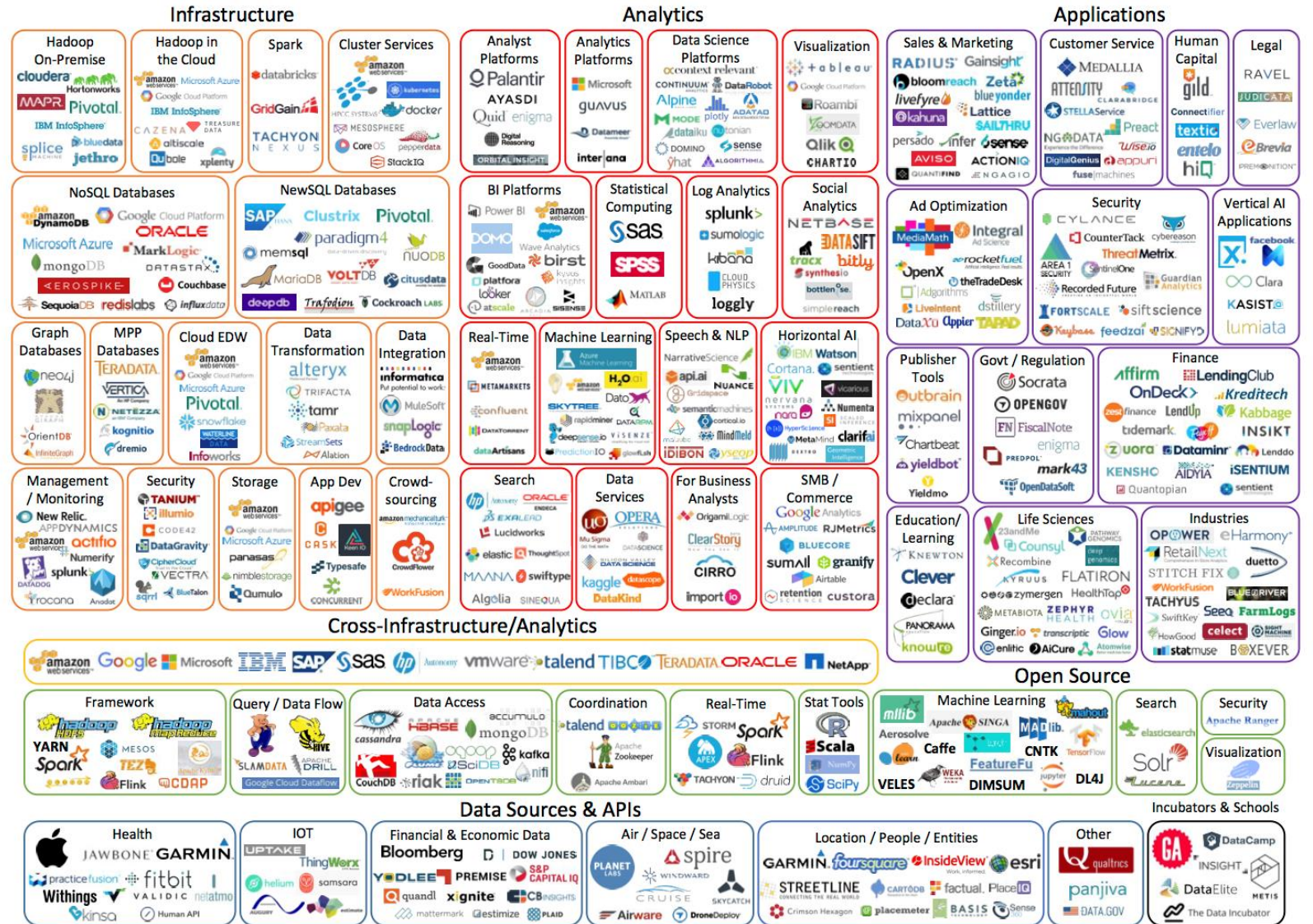
Renaissance in ANN (Deep NN), Reinforcement learning, etc.

What's next ? Singularity ([Ray Kurzweil](#)); doomsday; Stephen Hopkins



Software possibilities

Big Data Landscape 2016



© Matt Turck (@mattturck), Jim Hao (@jimrhao), & FirstMark Capital (@firstmarkcap)

FIRSTMARK

Big data, cloud and machine learning and their impact to education Blagoj Delipetrev



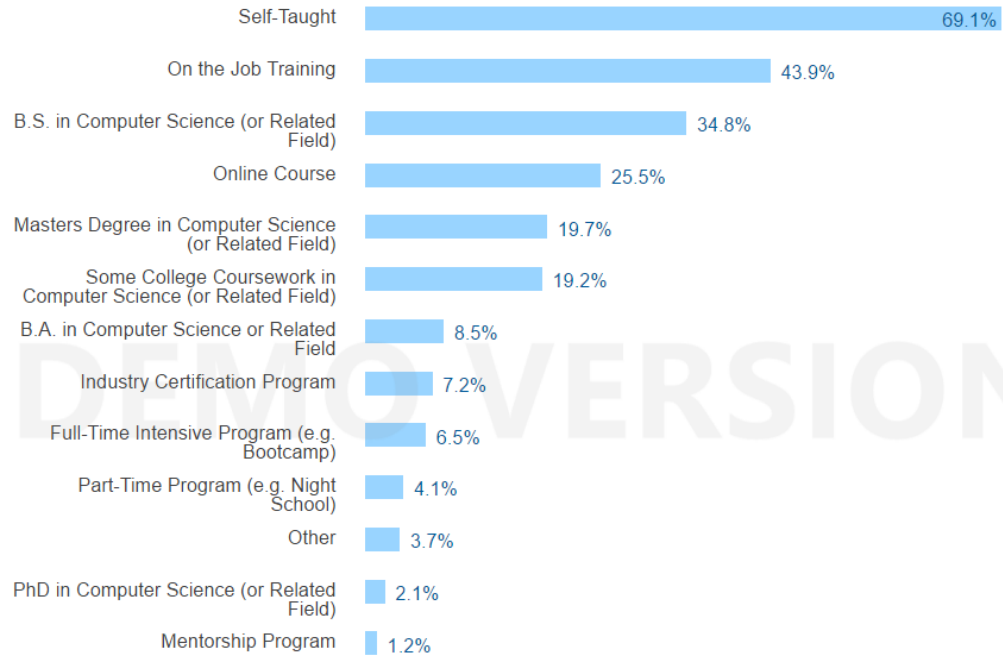
Education

- How to catch up? (Computer Science perspective)
- Exponential in hardware and software (software variety is staggering)
- Fundamentals are more or less the same, but the programming languages, technologies, platforms, etc. are changing in less than few year.
- Everyone should know to code.
- Change the educational program (especially University) frequently introducing new subjects (mobile programming, ML etc.)
- Continuous learning (many internet resources; massive online open courses)
- More students in STEM will benefit the society



Stack overflow statistics

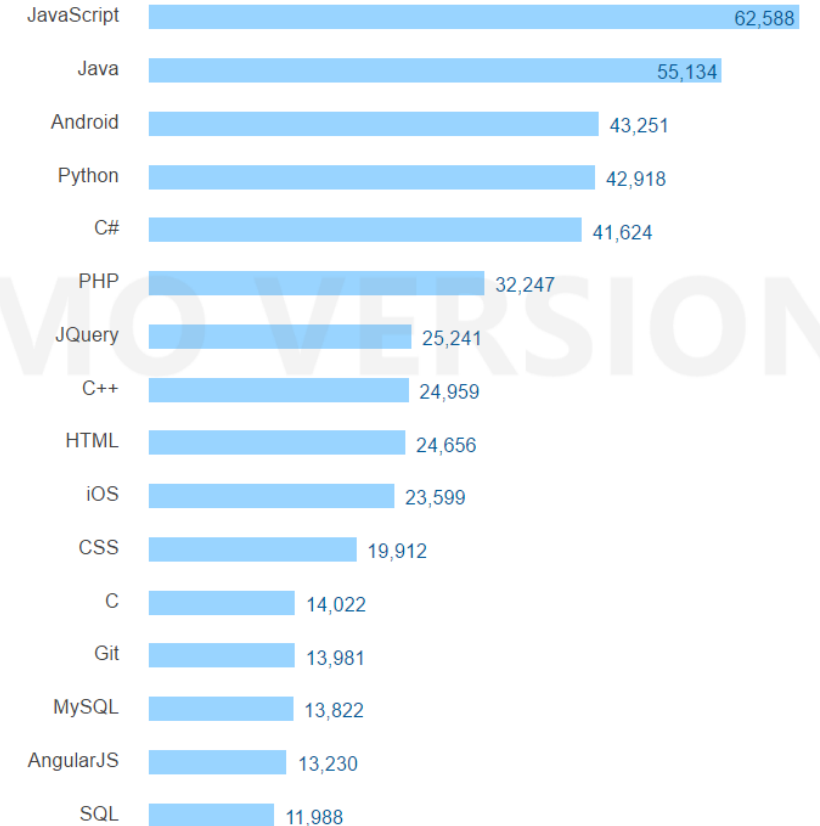
VIII. Education



40,183 responses from non-student developers

69% of all developers tell us they are at least partly self-taught. (13% of respondents across the globe tell us they are *only* self-taught.) 43% of developers have either a BA or BS in computer science or a related field. 2% of developers have a PhD.

III. Top Tech on Stack Overflow



Thanks for your attention

Associate professor Blagoj Delipetrev

Faculty of Computer Science

University Goce Delcev

Shtip, Republic of Macedonia

Email Blagoj.delipetrev@ugd.edu.mk

