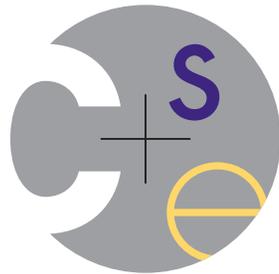


Luis Ceze

computer architecture, systems, PL



Application



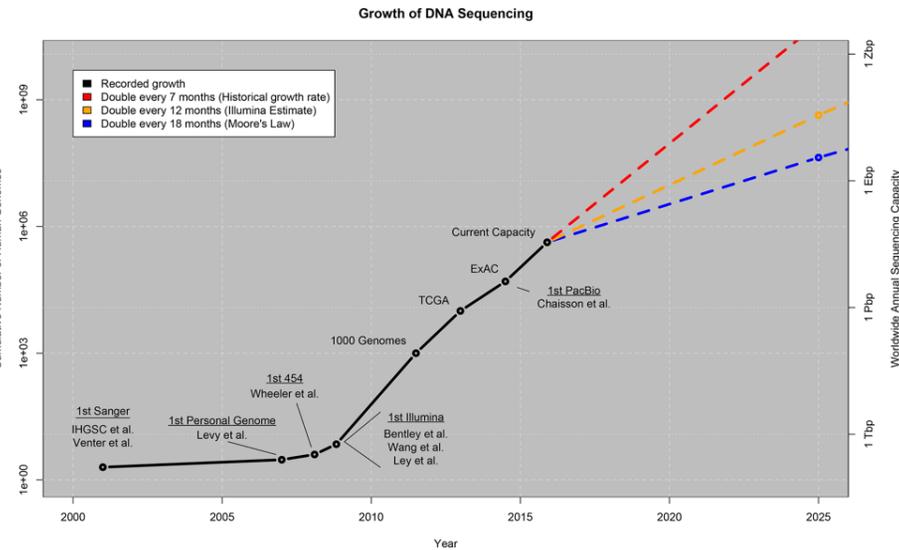
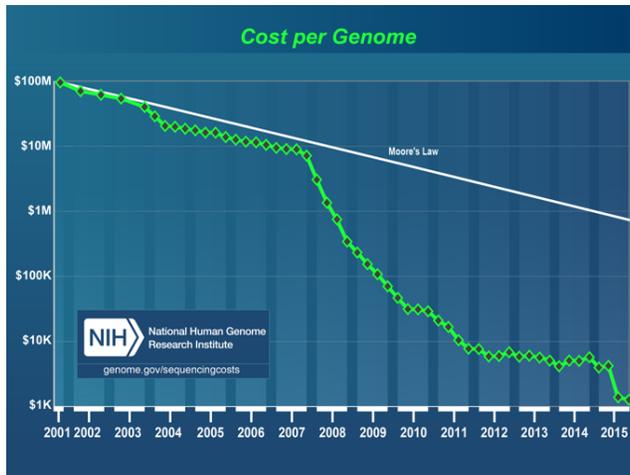
Realtime, live?



Planet-scale, realtime?

Estimate capture capability of the world in 2030:
12B streams, 6×10^{17} pixels \approx 600 quadrillion pixels.

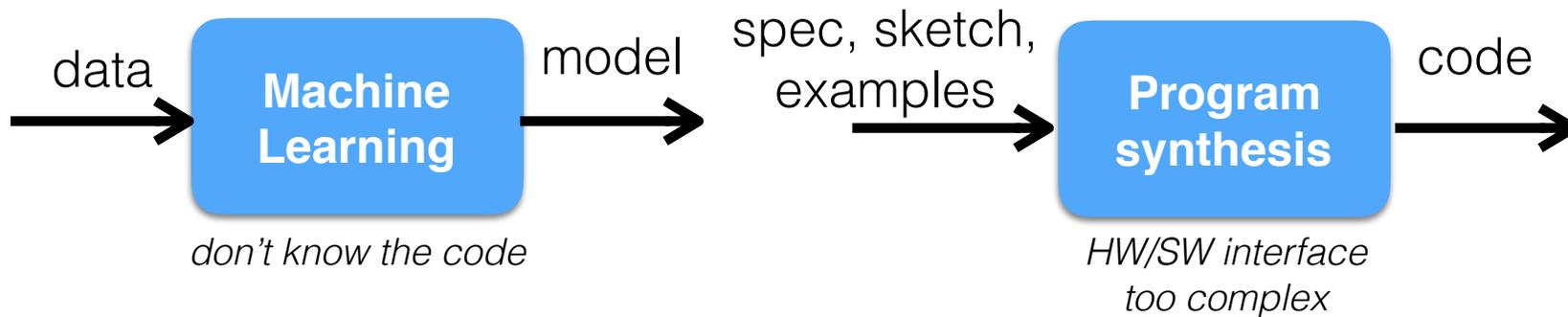
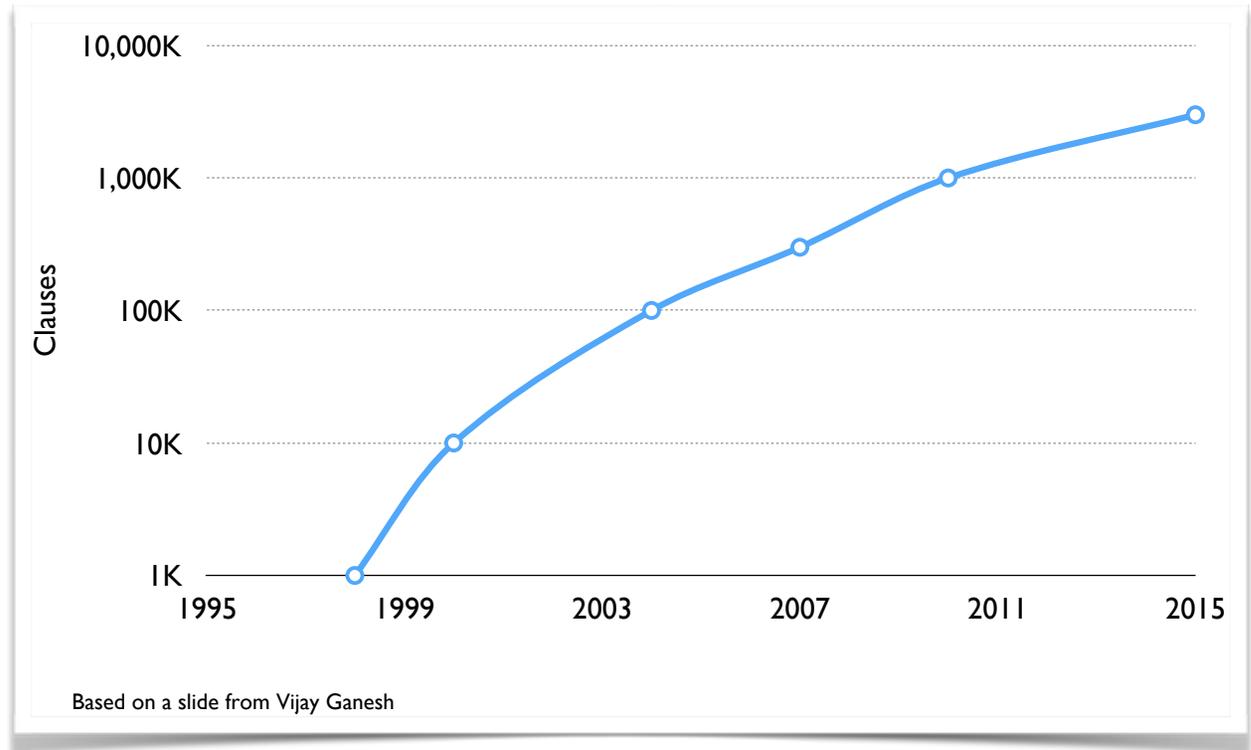
Planet-scale DNA sequencing and analysis



What about processing?

Sequencing and alignment of human genome: \sim 12 hours on a beefy server.
 \sim 100M servers worldwide \Rightarrow \sim 35 days to crunch genome for 7B people.
 (EC2 instance suitable for genomics: \$2.66/hr. \$200B+ just in compute power)

What about clinical sequencing? And non-human genomic analysis? Maybe computational cost of medicine in general?



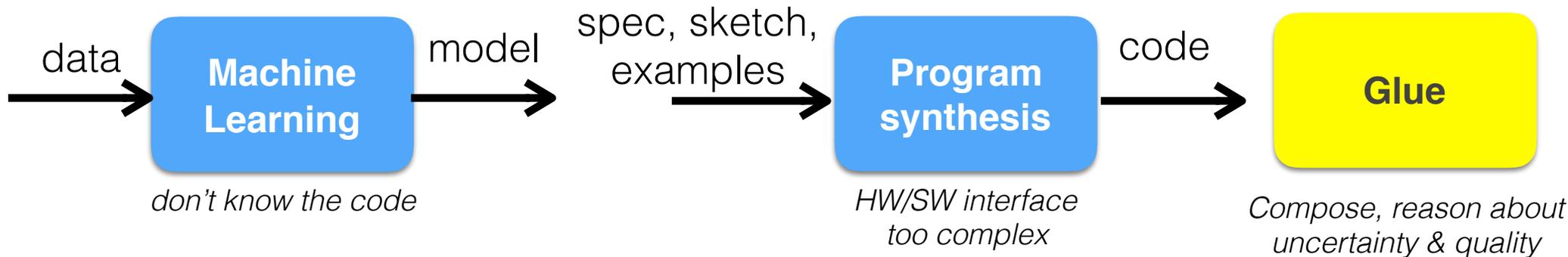
Architecture

Circuits/Devices

heterogeneity is natural
spatial fabrics programmed in space
compute+storage deeply integrated
noise and nondeterminism is unavoidable

Blur distinction between HW and SW

system design
specification language



Architecture

Circuits/Devices

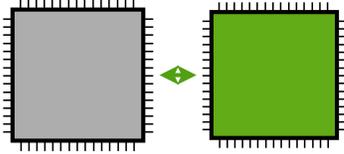
heterogeneity is natural
spatial fabrics programmed in space
compute+storage deeply integrated
noise and nondeterminism is unavoidable

right primitives?

behavior model?

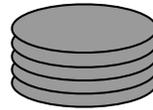
Specialization

compute



*accelerators,
reconfigurable logic*

storage



*tune to data type
source-channel joint coding*

communication

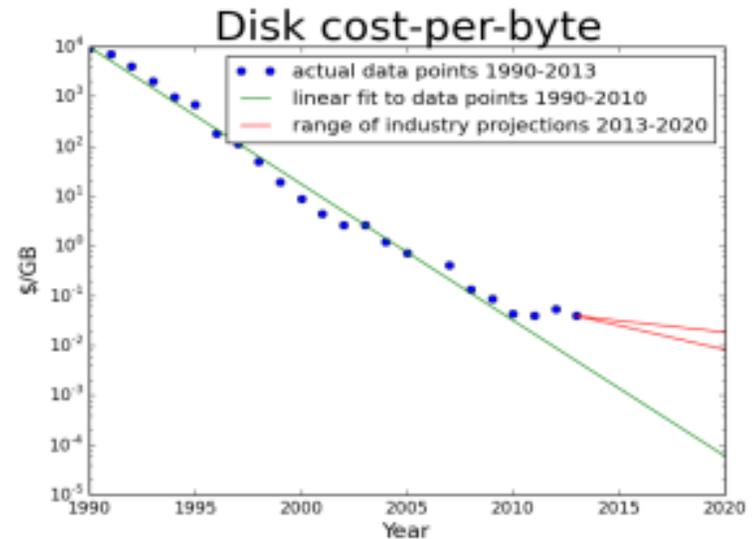
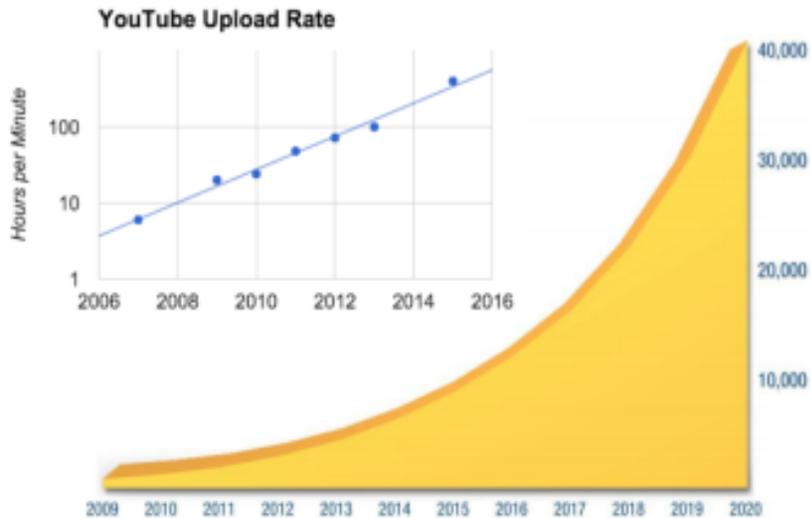


*topology to match app
tune coding to data type*

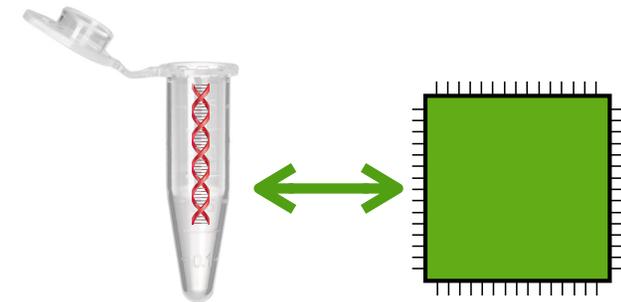
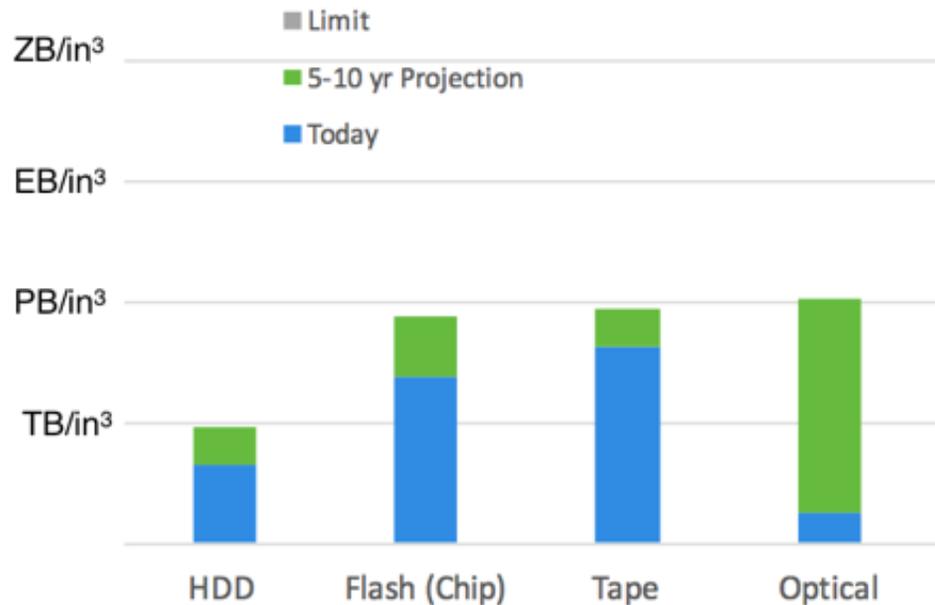
```
@Approx int a = ...;  
@Precise int p = ...;  
passert a != b, P, C;
```



A storage gap?



[Credit: David Rosenthal (CMU) and Preeti Gupta (UCSC),



Dense 3D
molecular storage