COL 215: Digital Logic & System Design

I Semester, 2021-22

Prof. Vireshwar Kumar

Prof. M Balakrishnan

Introduction: Instructors & TAs

Instructors

Prof. Vireshwar Kumar	viresh@cse.iitd.ac.in
Prof. M Balakrishnan	mbala@cse.iitd.ac.in

TAs

1. Divya Praneetha	csz178061@cse.iitd.ac.in
2. Aritra Bagchi	csz188295@cse.iitd.ac.in
3. Shikha Goel	anz162112@cse.iitd.ac.in
4. Ayushi Agarwal	anz188503@cse.iitd.ac.in
5. Akash Kumar	mcs202447@cse.iitd.ac.in
6. Sandeep Kumar	anz178353@cse.iitd.ac.in

Class Timings

- Tuesday, Wednesday, Friday 10 to 11 AM
  (E Slot)

- Online – TEAMs

- Slides and Videos to be available online

- Class divided into 6 groups (1 to 6)

- Each student to register for a weekly online help class taken by the respective TA

Assessment

- 10 to 14 Quizzes

(unannounced 5 to 10 minutes in the class)

- n conducted quizzes – (n-2) would be counted

Weightages

- Quizzes: 25%
- Minor: 30%
- Major: 45%

- 5 bonus marks for students scoring less than 30% if they attend 75% or more classes

Help Sessions

- Each TA would take 2 help sessions of 60 minutes each
- All the students have been divided into six groups and each group has been assigned a TA
- Each TA would announce the day and time for the two help sessions he/she would be taking
- Each of you is expected to register for one help session out of these two sessions with your TA
- Attendance in these sessions would be tracked especially among those students who are not scoring well in the exams

Introduction to Digital Systems

Analog to Digital Transition

Why did the world go digital?

- Much lower noise
- Higher level of integration
- Flexibility through programming
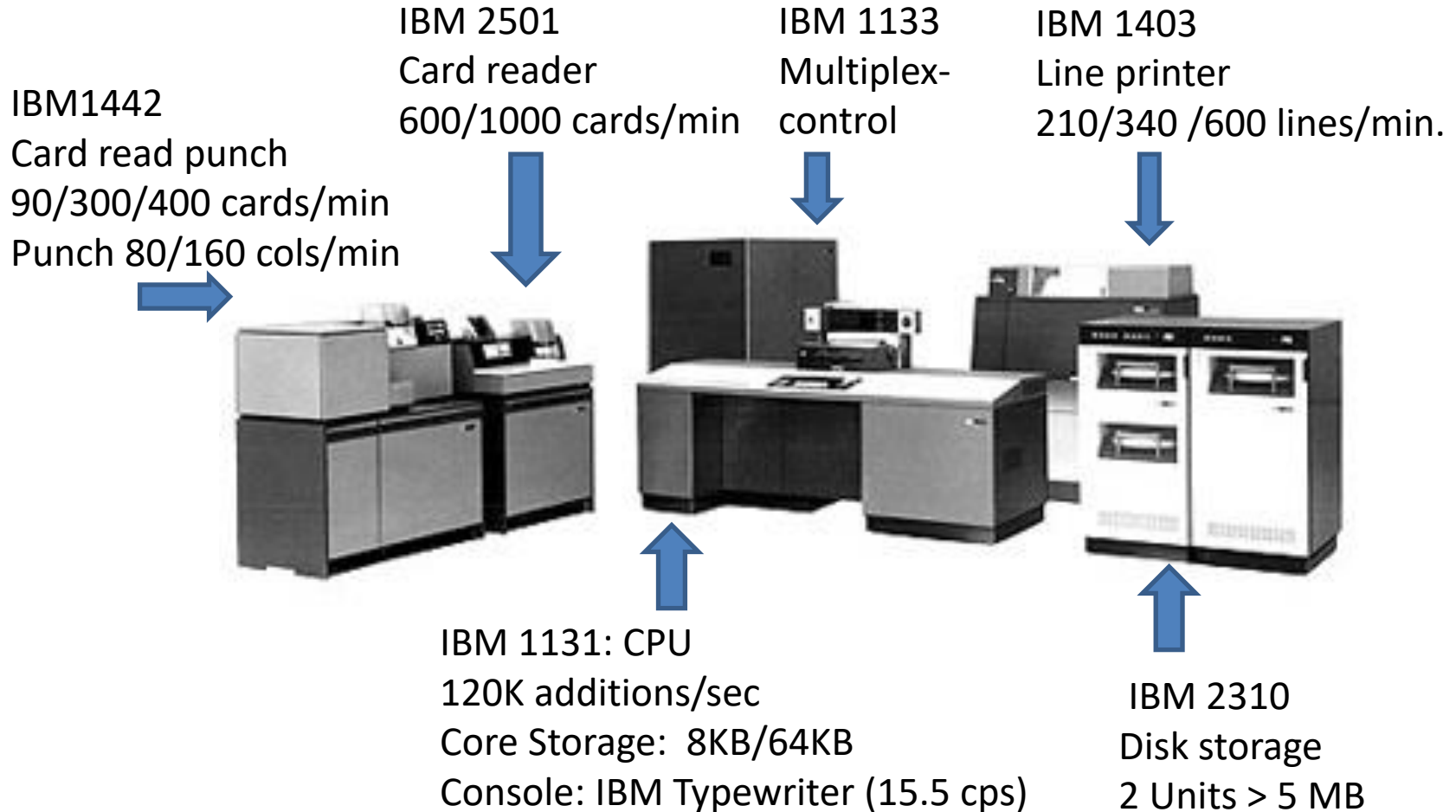
IBM System/370-165 Mainframe Computer

Source: https://www.ibm.com/ibm/history/exhibits/1130/1130_photo.html

Vintage Storage Devices

COL 215

IBM 1130 Installation

IBM 2501
Card reader
600/1000 cards/min

IBM 1133
Multiplex-
control

IBM 1403
Line printer
210/340 /600 lines/min.

IBM1442
Card read punch
90/300/400 cards/min
Punch 80/160 cols/min

IBM 1131: CPU
120K additions/sec
Core Storage: 8KB/64KB
Console: IBM Typewriter (15.5 cps)

IBM 2310
Disk storage
2 Units > 5 MB

Source: https://www.ibm.com/ibm/history/exhibits/1130/1130_photo.html

IBM Computer Card
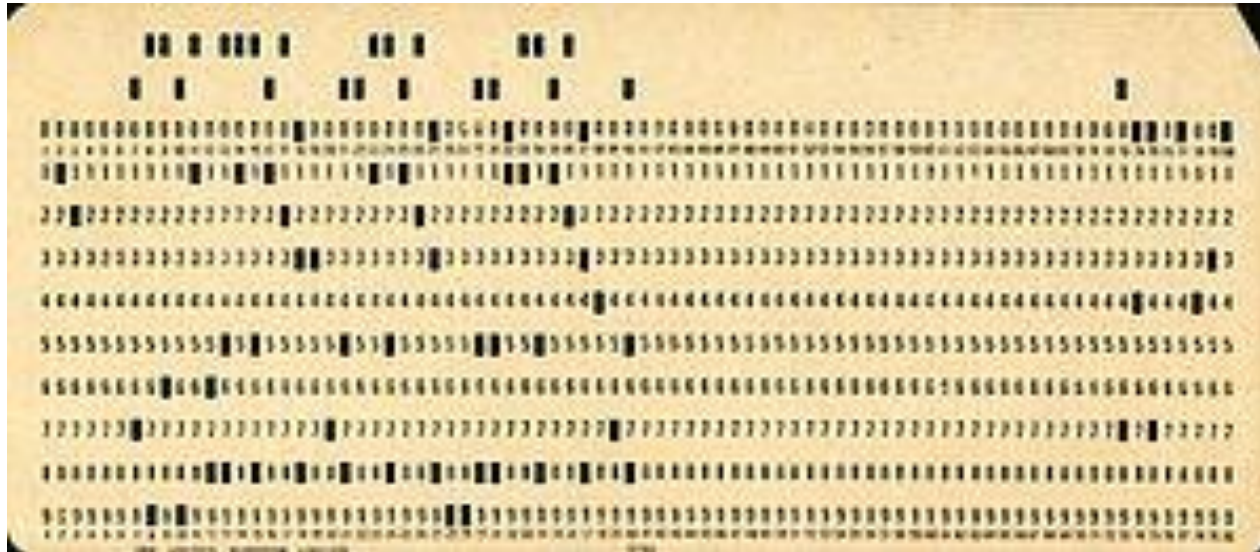
Program and Data Input: Computer card or Console
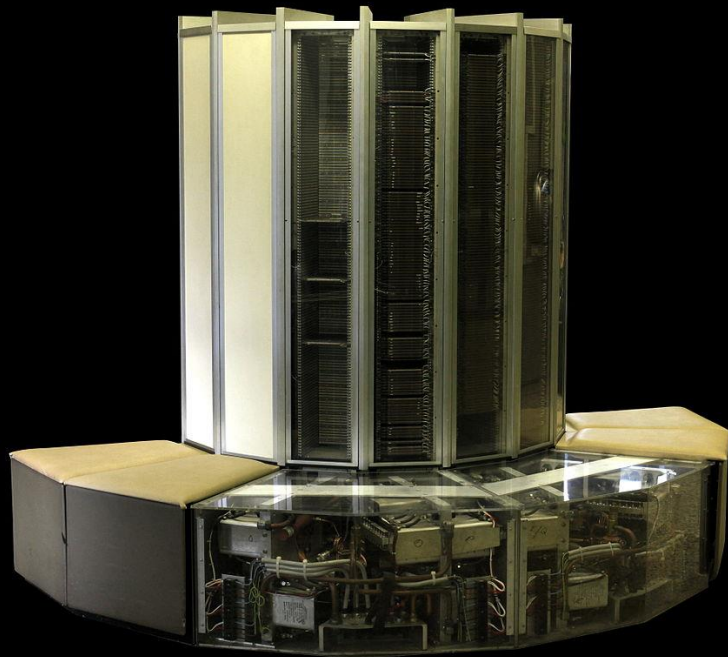80 columns correspond to 80 characters or 1-line (Fortran)

Cray-1 Installation
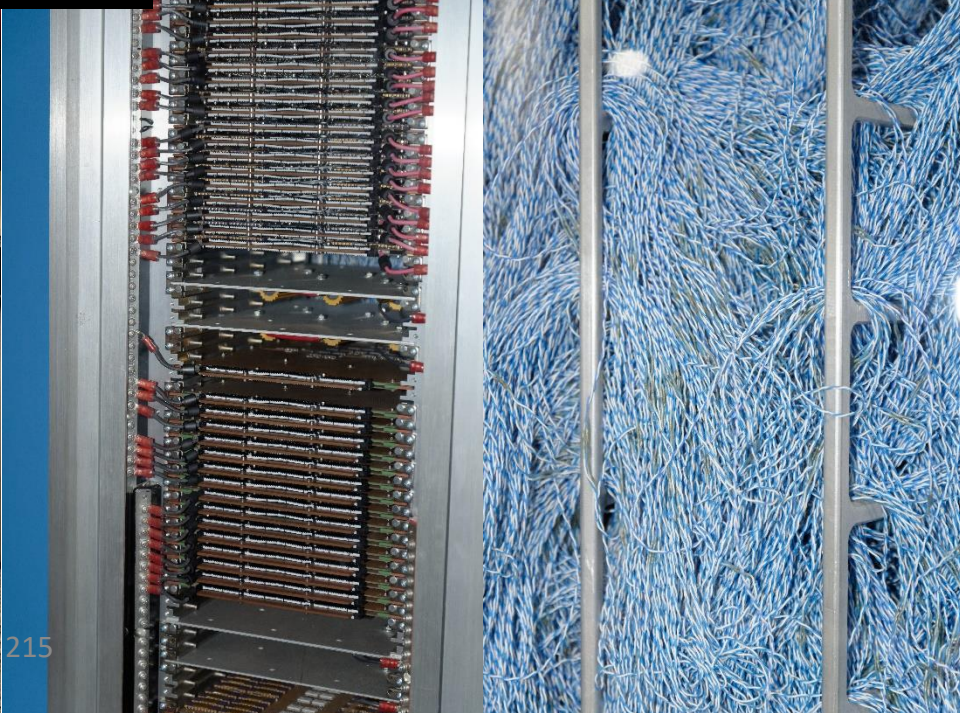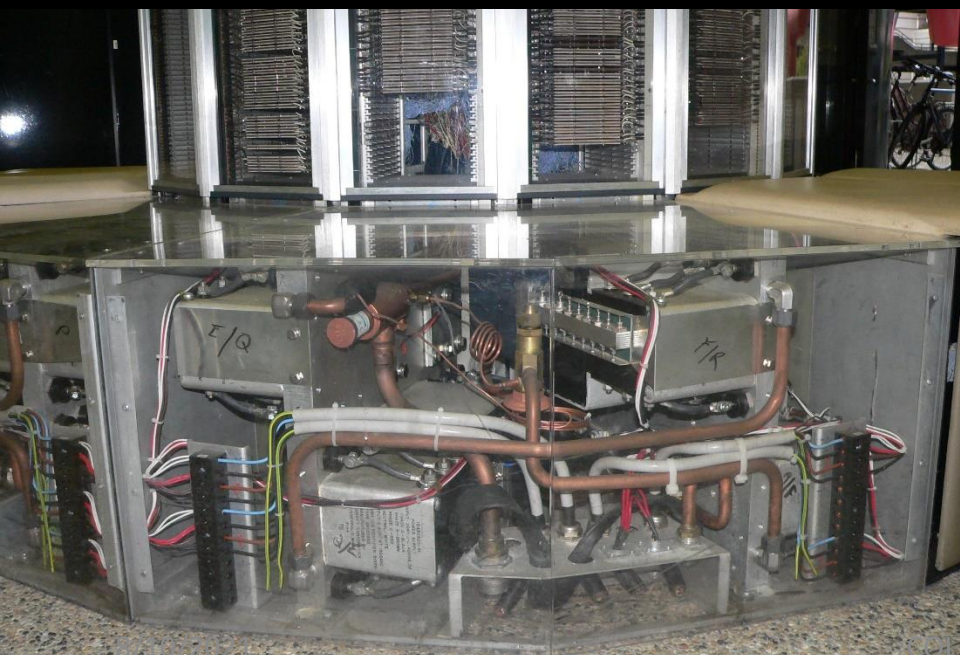## Computer Museum of America, Roswell, Georgia, US

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CRAY1
@
EPFL

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CRAY -1 Vs My Mobile (Samsung Note 8)

Manufacturer	Cray Research	Samsung
Release date	1975	2017 August
Units sold	Over 80	Many millions (launch - pre-order of 650000 from 40 countries in 5 days)
Price	US$7.9 M - 1977	INR 68,000/- (Launch in 2017)
Dimensions	Height: 196 cm Dia. (base): 263 cm Dia. (columns): 145 cm	Thickness: 8.6 mm Length: 162.5 mm Width: 74.8
Weight	5.5 tons (Cray-1A)	195 gms
Power	115 kW @ 208 V 400 Hz	Li-Ion 3300 mAh
OS	COS & UNICOS	Android 7.1.1 (Nougat), upgradable
CPU	64-bit processor @ 80 MHz	Octa-core (4x2.3 GHz Mongoose M2 & 4x1.7 GHz Cortex-A53) (64-bit)
Memory	8.39 MB	6 GB
Storage	303 MB	64 GB
FLOPS	160 MFLOPS	Upto 3.5 Gflops

A Modern Data Centre
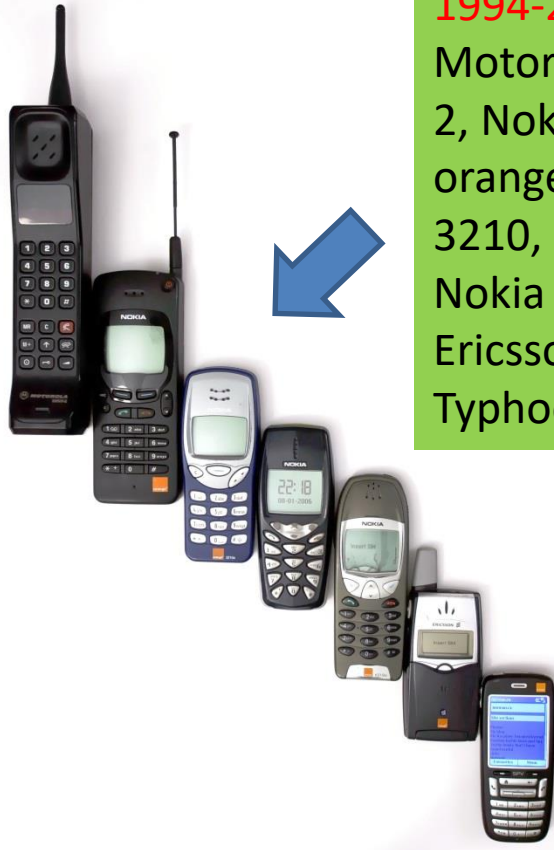

https://rmonnetworks.com/cabling-services/data-center-installations/

Mobile Phone Evolution

1994-2004
Motorola 8900X-2, Nokia 2146 orange 5.1, Nokia 3210, Nokia 3510, Nokia 6210, Ericsson T39, HTC Typhoon
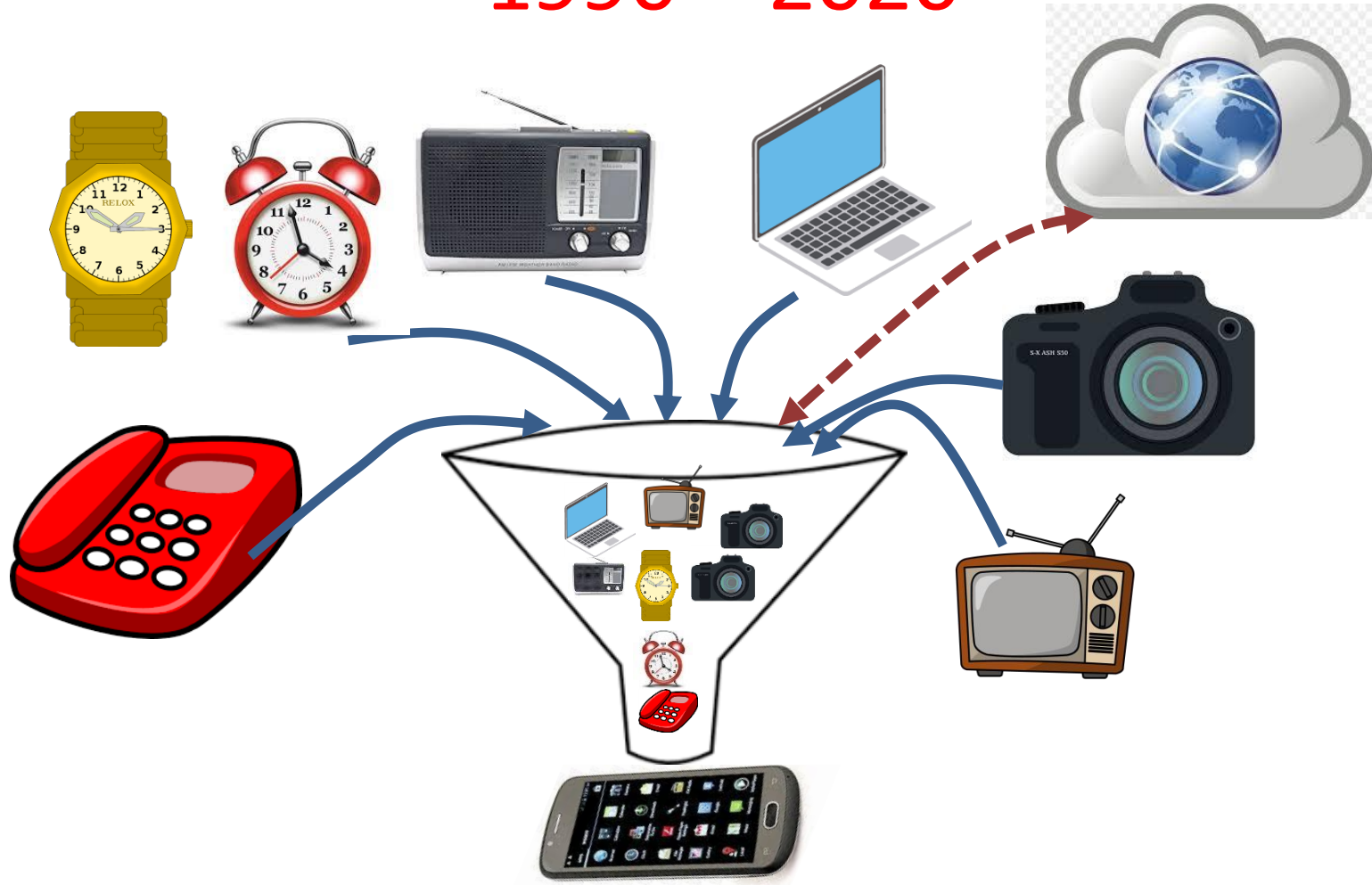
2007 - 2014
iPhone 3G, Samsung Galaxy S4, Samsung Galaxy S4 Mini, iPhone 5s, iPhone 6 Plus.

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Mobile Phone Functionality Growth
1990 – 2020

Key Drivers: Digital Revolution

- Transistor size reduction
  - 100s of microns (10^{-6}) to few nanometers (10^{-9})
- Speed
  - 10s of KHz to GHz
- Integration (transistor density)
  - 10s of transistors to millions per sqcm
- Power reduction

Both computation as well as memory has seen this dramatic growth

Thank You