

# Lecture Notes of Computer Architecture Studies

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## Abstract

This lecture notes combines two classes, **Digital Design and Computer Architecture**, and **(Advanced) Computer Architecture** taught by **Prof. Onur Mutlu** at ETH Zurich.

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## §1 February 25, 2021

Lecture was almost all of motivations for cutting-edge computer architecture.

I liked a lot to read the classical article **Moore (1965)**, yeah, the one that claims what was called later as Moore's law. I didn't know he did another interest predictions as home computers, mobile phones, etc.

### §1.1 Numerical Representations

To change from decimal representation to a  $k$ -representation, we just need to divide the number by  $k$  until the quotient is zero. Then we take all the remainders backwards (from the latest to the first).

This is an **example** of emphasize and here a **bold text**.

### §1.2 First Subsection

Table **1** is the first one.

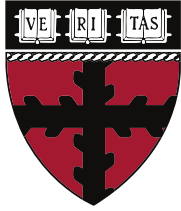
Figure **1** is the first one.

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Table 1. First table.

Quadrant	5 m	10 m
Quadrant I	8.63%	9.11%
Quadrant II	5.63%	7.77%



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Figure 1. First figure.

**Definition 1.1.** An **inner product** on  $V$  is a function that takes each ordered pair  $(u, v)$  of elements of  $V$  to a number  $\langle u, v \rangle \in \mathbf{F}$  and has the following properties:

**positivity**

$$\langle v, v \rangle \geq 0 \text{ for all } v \in V;$$

**definiteness**

$$\langle v, v \rangle = 0 \text{ if and only if } v = 0;$$

**additivity in first slot**

$$\langle u + v, w \rangle = \langle u, w \rangle + \langle v, w \rangle \text{ for all } u, v, w \in V;$$

**homogeneity in first slot**

$$\langle \lambda u, v \rangle = \lambda \langle u, v \rangle \text{ for all } \lambda \in \mathbf{F} \text{ and all } u, v \in V;$$

**conjugate symmetry**

$$\langle u, v \rangle = \overline{\langle v, u \rangle} \text{ for all } u, v \in V.$$

- The **Euclidean inner product** on  $\mathbf{F}^n$

$$\langle (w_1, \dots, w_n), (z_1, \dots, z_n) \rangle = w_1 \overline{z_1} + \dots + w_n \overline{z_n};$$

- An inner product can be defined on the vector space of continuous real-valued functions on the interval  $[-1, 1]$  by

$$\langle f, g \rangle = \int_{-1}^1 f(x)g(x)dx.$$

- The correlation function

$$(f \star g)[n] = \sum_m \overline{f[m]}g[m+n]$$

## References

Moore, G. E. (1965). Cramming more components onto integrated circuits. *Electronics magazine*.