

# Introduction to Manifold Learning

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A Geometry View on Machine Learning

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# Outline for Section 1

## 1. Manifold

- 1.1 Blind Text
- 1.2 Structuring Elements
- 1.3 Numerals and Mathematics
- 1.4 Figures and Code Listings
- 1.5 Citations and Bibliography
- 1.6 Citations and Bibliography

## Manifold

'Twas brillig, and the slithy toves  
Did gyre and gimble in the wabe;  
All mimsy were the borogoves,  
And the mome raths outgrabe.

“Beware the Jabberwock, my son!  
The jaws that bite, the claws that catch!  
Beware the Jubjub bird, and shun  
The frumious Bandersnatch!”

## Lists and locales

## Text blocks

*In plain, example, and **alert** flavour*

**This text** is highlighted.

A plain block

This is a plain block containing some **highlighted text**.

An example block

This is an example block containing some **highlighted text**.

An alert block

This is an alert block containing some **highlighted text**.

# Definitions, theorems, and proofs

*All integers divide zero*

## Definition

$$\forall a, b \in \mathbb{Z} : a \mid b \iff \exists c \in \mathbb{Z} : a \cdot c = b$$

## Theorem

$$\forall a \in \mathbb{Z} : a \mid 0$$

## Proof

$$\forall a \in \mathbb{Z} : a \cdot 0 = 0$$



# Numerals and Mathematics

Formulae, equations, and expressions

$$1234567890 \quad 1234567890 \quad \hat{x}, \check{x}, \tilde{a}, \bar{a}, \dot{y}, \ddot{y} \iiint f(x, y, z) \, dx dy dz$$

$$\frac{1}{1 + \frac{1}{2 + \frac{1}{3 + x}}} + \frac{1}{1 + \frac{1}{2 + \frac{1}{3 + x}}}$$

$$F : \begin{vmatrix} F''_{xx} & F''_{xy} & F'_x \\ F''_{yx} & F''_{yy} & F'_y \\ F'_x & F'_y & 0 \end{vmatrix} = 0$$

$$\iint_{\mathbf{x} \in \mathbb{R}^2} \langle \mathbf{x}, \mathbf{y} \rangle \, d\mathbf{x}$$

$$\overline{\overline{a\alpha^2 + \underline{b\beta} + \overline{\overline{d\delta}}}}$$

$$]0,1[ + \lceil x \rceil - \langle x, y \rangle$$

$$e^x \approx 1 + x + x^2/2! + x^3/3! + x^4/4!$$

$$\binom{n+1}{k} = \binom{n}{k} + \binom{n}{k-1}$$

## Figures

*Tables, graphs, and images*

Faculty	With T <sub>E</sub> X	Total	%
Faculty of Informatics	1 716	2 904	59.09
Faculty of Science	786	5 275	14.90
Faculty of Economics and Administration	64	4 591	1.39
Faculty of Arts	69	10 000	0.69
Faculty of Medicine	8	2 014	0.40
Faculty of Law	15	4 824	0.31
Faculty of Education	19	8 219	0.23
Faculty of Social Studies	12	5 599	0.21
Faculty of Sports Studies	3	2 062	0.15

Table: The distribution of theses written using T<sub>E</sub>X during 2010–15 at MU



## Figures

*Tables, graphs, and images*

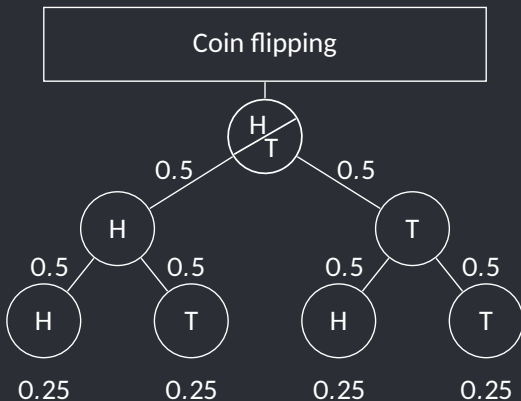


Figure: Tree of probabilities – Flipping a coin<sup>1</sup>

<sup>1</sup>A derivative of a diagram from [texample.net](https://texample.net) by cis, CC BY 2.5 licensed

## Code listings

*An example source code in C*

```
#include <stdio.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/wait.h>

// This is a comment
int main(int argc, char **argv)
{
    while (--c > 1 && !fork());
    sleep(c = atoi(v[c]));
    printf("%d\n", c);
    wait(0);
    return 0;
}
```

## Citations

*T<sub>E</sub>X*, L<sup>A</sup>T<sub>E</sub>X, and Beamer

T<sub>E</sub>X is a programming language for the typesetting of documents. It was created by Donald Erwin Knuth in the late 1970s and it is documented in *The T<sub>E</sub>Xbook* [1].

In the early 1980s, Leslie Lamport created the initial version of L<sup>A</sup>T<sub>E</sub>X, a high-level language on top of T<sub>E</sub>X, which is documented in *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System* [2]. There exists a healthy ecosystem of packages that extend the base functionality of L<sup>A</sup>T<sub>E</sub>X; *The L<sup>A</sup>T<sub>E</sub>X Companion* [3] acts as a guide through the ecosystem.

In 2003, Till Tantau created the initial version of Beamer, a L<sup>A</sup>T<sub>E</sub>X package for the creation of presentations. Beamer is documented in the *User's Guide to the Beamer Class* [4].

# Bibliography

$T_{\text{E}}\text{X}$ ,  $\text{\LaTeX}$ , and Beamer

- [1] Donald E. Knuth. *The  $T_{\text{E}}\text{X}$ book*. Addison-Wesley, 1984.
- [2] Leslie Lamport.  *$\text{\LaTeX}$ : A Document Preparation System*. Addison-Wesley, 1986.
- [3] M. Goossens, F. Mittelbach, and A. Samarin. *The  $\text{\LaTeX}$  Companion*. Addison-Wesley, 1994.
- [4] Till Tantau. *User's Guide to the Beamer Class Version 3.01*. Available at <http://latex-beamer.sourceforge.net>.
- [5] A. Mertz and W. Slough. Edited by B. Beeton and K. Berry. *Beamer by example* In TUGboat, Vol. 26, No. 1., pp. 68-73.

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- [2] Leslie Lamport. *L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System*. Addison-Wesley, 1986.
- [3] M. Goossens, F. Mittelbach, and A. Samarin. *The L<sup>A</sup>T<sub>E</sub>X Companion*. Addison-Wesley, 1994.
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