



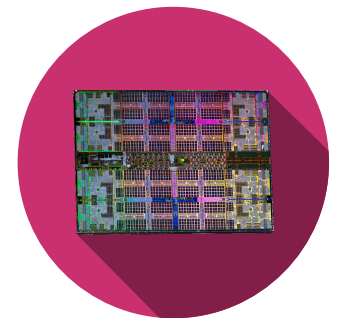
Computer Architecture

Introduction

Ind

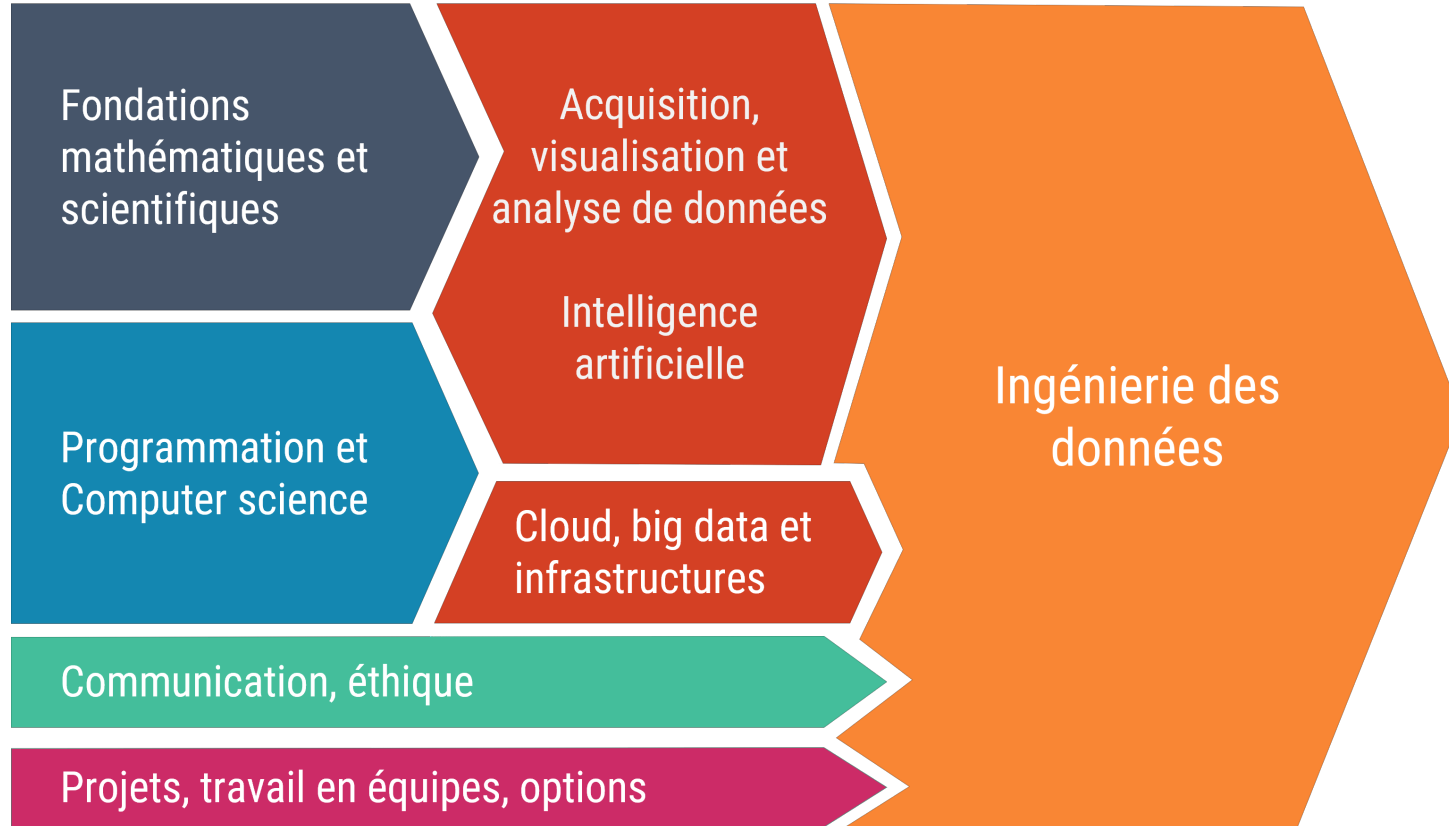
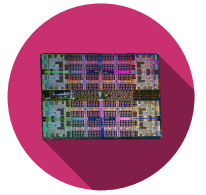
Information and Communication Systems program

Silvan Zahno silvan.zahno@hevs.ch



Modules

ISC

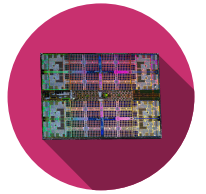


**BSc en Informatique
et Systèmes de
communication**



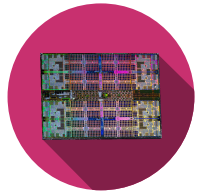
Modules

First Year



1 ^{ère} année / 1. Jahr	Cours Vorlesungen	Heures Stunden	Crédits Credits
	Semestre 1 / Semester 1	32	28
	Algèbre linéaire 1 / Lineare Algebra 1	4	4
	Analyse 1 / Analysis 1	6	5
	Communication 1 / Kommunikation 1	2	2
	Ethique et aspects juridiques / Ethik und Rechtsaspekte	2	2
	Langues 1 / Sprachen 1	4	3
	Programmation impérative / Imperative Programmierung	8	7
	Systèmes numériques / Digitale Technik	6	5
	Semestre 2 / Semester 2	36	32
ZaS	Algèbre linéaire 2 / Lineare Algebra 1	4	4
	Analyse 2 / Analysis 2	6	5
	Architecture des ordinateurs / Computerarchitektur	4	3
	Communication 2 / Kommunikation 2	2	2
	Intro. à la sécurité / Sicherheitbewusstsein	4	3
	Langues 2 / Sprachen 2	4	3
	Programmation objet / Objektorientierte Programmierung	8	6
	Réseaux / Netzwerke	4	6
	Projet 1 / Projekt 1		
	CAr Ind	Summer school	3 4

Goal of the course



Understand the basic structure of modern computers and its connection with programming.

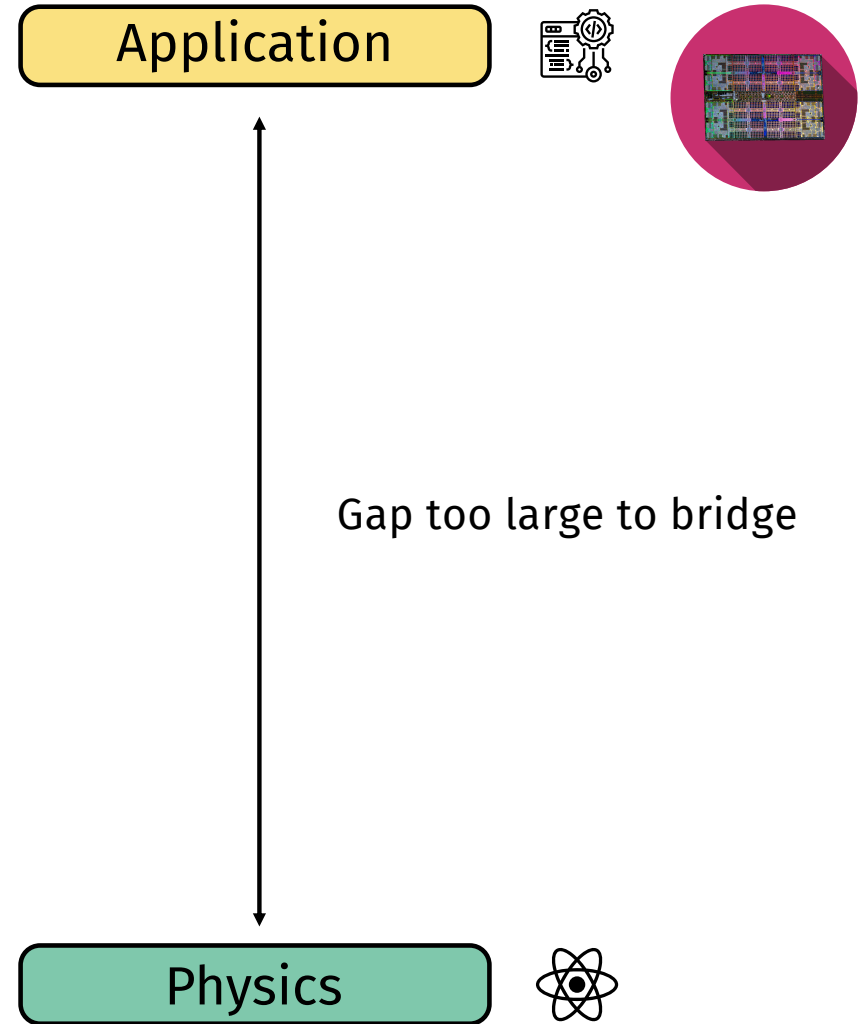
This means:

- Methodical basics: beginning of the semester
- Simple system: end of the semester

What is Computer Architecture?

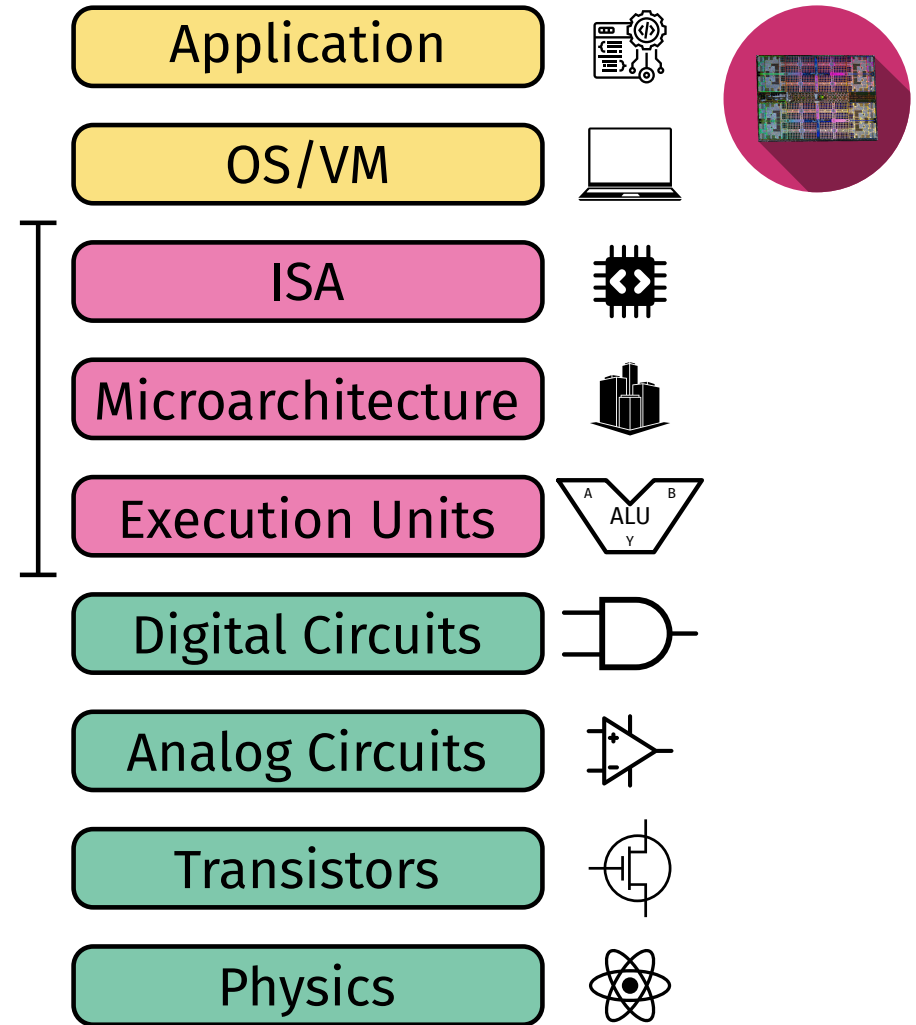
The gap

In the most general definition, computer architecture is the design of the abstraction and implementation layers that allow us to execute information processing applications efficiently using manufacturing technologies



What is Computer Architecture?

The different layers



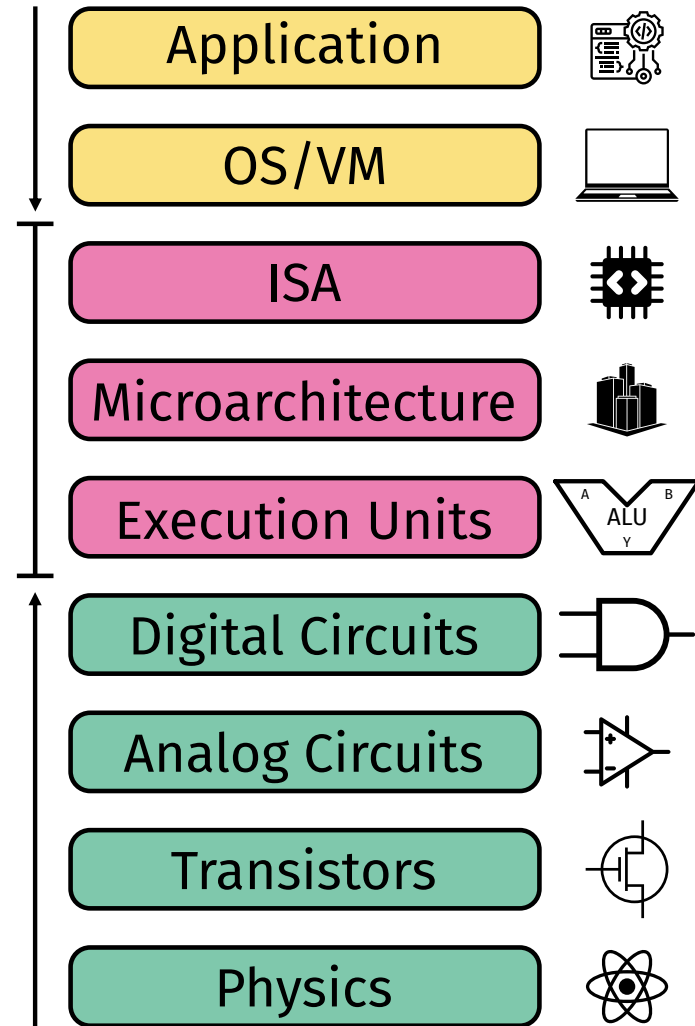
What is Computer Architecture?

Constantly changing

Application
Requirements

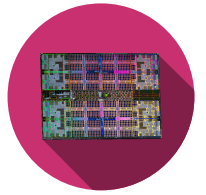
Car
We are here

Technology
Constraints

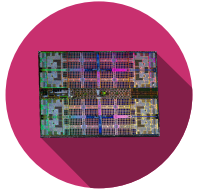


Computer Architecture in practice

Ariane 5

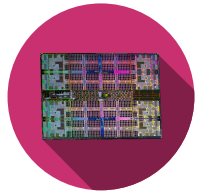


Application Areas



Organisation

Professors



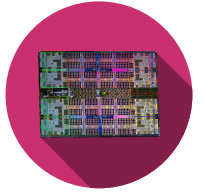
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Andrea Guerrieri Andrea (GuA)
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Organisation

Collaborateurs

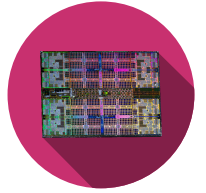


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Remy Borgeat (BoY)
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Tel: +41 58 606 92 20

Organisation



- Cours - 2h/week
- Labor - 2h/week
- Project - last 5-6 weeks
- Exam
 - Labo evaluation
 - Project evaluation
 - Exam at the end of the semester (only summary of 2 pages allowed)

	<i>Fallsemester (DiD)</i>			<i>Springsemester (CAr)</i>		
Evaluation	Exa 1	Project	Exa Sem	Labo	Project	Exa
Coefficient	0.5	0.5	1	0.5	0.5	1
Semestergrade	1		1	1		1
Modulegrade	5/9			4/9		

Documents and Informations

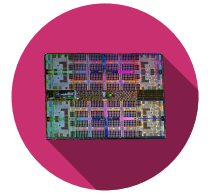
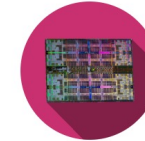
Moodle ISC Learn

- 102.2 – ArchOrd
- Password: welcome

Microsoft Teams

- 24_ISC_CAR
- Access Code: ih8wehx
- Channels
 - Announcements – Message of the module management
 - General – Class chat

INFORMATIONS DU MODULE – MODULINFORMATIONEN MODULE Car – KURS Car



Le module "102 Architecture matérielle" est composé des deux cours suivants: 102.1 Systèmes numériques et 102.2 Architecture des ordinateurs.

Vous trouverez tous les documents de cours sur le repo Git.

Download: [zip](#)

Clone the repo [git clone https://github.com/hei-isc-car/car-docs.git](#)

Descriptive du module / Modulbeschreibung

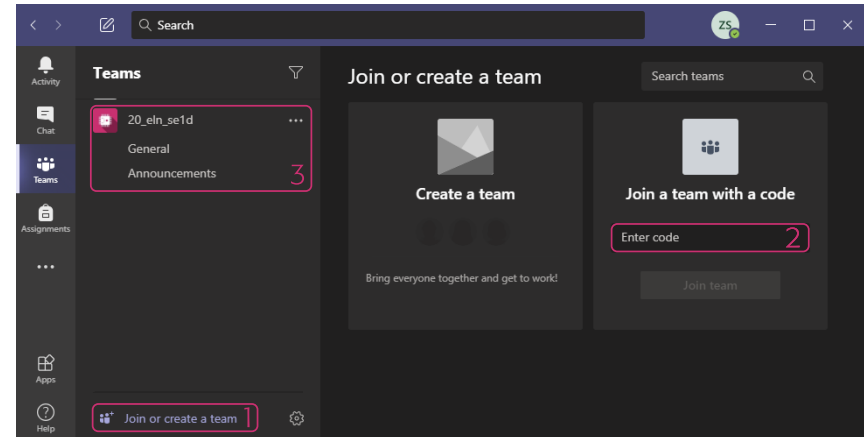
- 102-Architecture_matiérielle_de
- 102-Architecture_matiérielle_fr
- 102-Architecture_matiérielle_en

Planification hebdomadaire / Wochenplanung

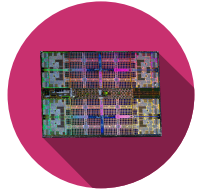
- Car-ISC-Planning

Das Modul "102 Materielle Architektur" besteht aus den beiden folgenden Kursen: 102.1 Digitale Systeme und 102.2 Computerarchitektur.

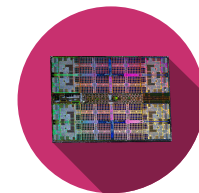
Alle Kursdokumente finden Sie auf dem Git Repository.



What programming languages do you know?

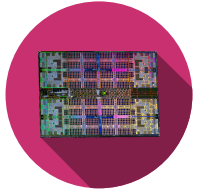


Energy Efficiency across Programming Languages



Total					
Energy		Time		Mb	
(c) C	1.00	(c) C	1.00	(c) Pascal	1.00
(c) Rust	1.03	(c) Rust	1.04	(c) Go	1.05
(c) C++	1.34	(c) C++	1.56	(c) C	1.17
(c) Ada	1.70	(c) Ada	1.85	(c) Fortran	1.24
(v) Java	1.98	(v) Java	1.89	(c) C++	1.34
(c) Pascal	2.14	(c) Chapel	2.14	(c) Ada	1.47
(c) Chapel	2.18	(c) Go	2.83	(c) Rust	1.54
(v) Lisp	2.27	(c) Pascal	3.02	(v) Lisp	1.92
(c) Ocaml	2.40	(c) Ocaml	3.09	(c) Haskell	2.45
(c) Fortran	2.52	(v) C#	3.14	(i) PHP	2.57
(c) Swift	2.79	(v) Lisp	3.40	(c) Swift	2.71
(c) Haskell	3.10	(c) Haskell	3.55	(i) Python	2.80
(v) C#	3.14	(c) Swift	4.20	(c) Ocaml	2.82
(c) Go	3.23	(c) Fortran	4.20	(v) C#	2.85
(i) Dart	3.83	(v) F#	6.30	(i) Hack	3.34
(v) F#	4.13	(i) JavaScript	6.52	(v) Racket	3.52
(i) JavaScript	4.45	(i) Dart	6.67	(i) Ruby	3.97
(v) Racket	7.91	(v) Racket	11.27	(c) Chapel	4.00
(i) TypeScript	21.50	(i) Hack	26.99	(v) F#	4.25
(i) Hack	24.02	(i) PHP	27.64	(i) JavaScript	4.59
(i) PHP	29.30	(v) Erlang	36.71	(i) TypeScript	4.69
(v) Erlang	42.23	(i) Jruby	43.44	(v) Java	6.01
(i) Lua	45.98	(i) TypeScript	46.20	(i) Perl	6.62
(i) Jruby	46.54	(i) Ruby	59.34	(i) Lua	6.72
(i) Ruby	69.91	(i) Perl	65.79	(v) Erlang	7.20
(i) Python	75.88	(i) Python	71.90	(i) Dart	8.64
(i) Perl	79.58	(i) Lua	82.91	(i) Jruby	19.84

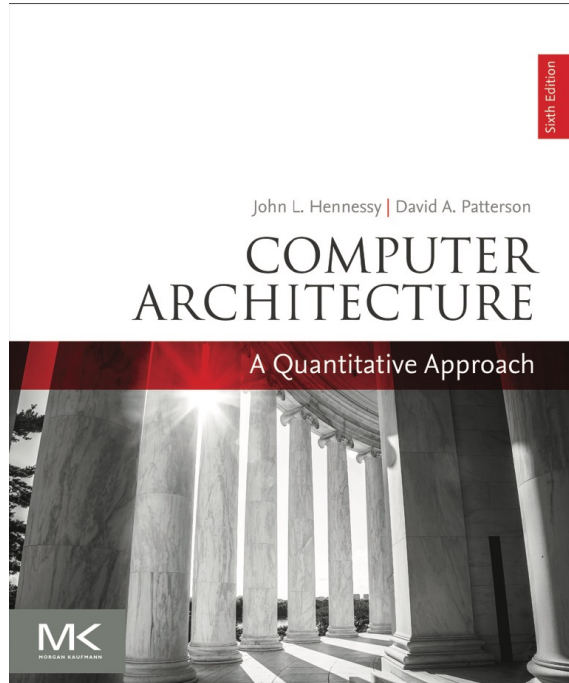
Additional Books



Computer Architecture – A Quantitative Approach

John L. Hennessy & David A. Patterson

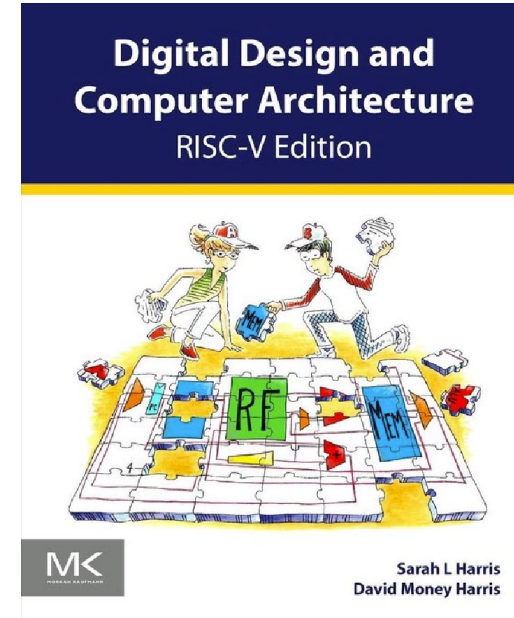
ISBN: 978-0-12-811905-1



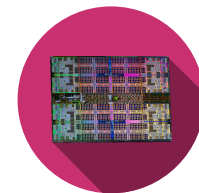
Digital Design and Computer Architecture

Sarah L. Harris & David Money Harris

ISBN: 978-0-12-820064-3



References



[1]

“Ariane 5 rocket launch explosion - YouTube.” https://www.youtube.com/watch?v=PK_yguLapgA&t=142s (accessed Jul. 18, 2022).

[2]

J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach*, 6th Edition. Elsevier, 2019.

[3]

HEVs, “Formation Bachelor Ingénieur-e en I... | HES-SO Valais-Wallis,” *La HES-SO Valais-Wallis propose 10 filières de formation dans 5 Hautes Ecoles: Ingénierie, Gestion, Santé, Travail Social et Art.* <https://www.hevs.ch/fr/hautes-ecoles/haute-ecole-d-ingenierie/informatique-et-systemes-de-communication/formation-bachelor-ingenieure-en-informatique-et-systemes-de-communication-201140> (accessed Jul. 18, 2022).

[4]

Prof. Dr. Ben H. Juurlink, *TU Berlin: Course AES*, (Oct. 22, 2018). Accessed: Jul. 18, 2022. [Online Video]. Available: <https://www.youtube.com/channel/UCPSsA8oxISBjidJsSPdpjsQ>

[5]

R. Pereira et al., “Energy efficiency across programming languages: how do energy, time, and memory relate?,” in *Proceedings of the 10th ACM SIGPLAN International Conference on Software Language Engineering*, Vancouver BC Canada: ACM, Oct. 2017, pp. 256–267. doi: [10.1145/3136014.3136031](https://doi.org/10.1145/3136014.3136031).

WHY ARE THERE MIRRORS ABOVE BEDS

WHY DO I SAY UH

WHY IS SEA SALT BETTER

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WHY ARE THERE TWO SLASHES AFTER HTTP

WHY ARE THERE CELEBRITIES

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WHY IS THERE SO LITTLE RAIN IN WALLIS

WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG

WHY ARE THERE MALE AND FEMALE BIKES

WHY ARE THERE BRIDESMAIDS

WHY DO DYING PEOPLE REACH UP

HOW FAST IS LIGHTSPEED

WHY ARE OLD KLINGONS DIFFERENT

WHY ARE THERE TINY SPIDERS IN MY HOUSE

WHY DO SPIDERS COME INSIDE

WHY ARE THERE HUGE SPIDERS IN MY HOUSE

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WHY IS DYING SO SCARY

WHY IS THERE NO GPS IN LAPTOPS

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WHY AREN'T THERE 5 GRADES

WHY 2*B I 2*B

WHY ARE THERE GHOSTS

WHY ARE THERE AN OWL IN MY BACKYARD

WHY IS THERE AN OWL OUTSIDE MY WINDOW

WHY IS THERE AN OWL ON THE DOLLAR BILL

WHY DO OWLS ATTACK PEOPLE

WHY HAVE DINOSAURS NO FUR

WHY DO IGUANAS DIE

WHY AREN'T ECONOMISTS RICH

WHY DO AMERICANS CALL IT SOCCER

WHY ARE MY EARS RINGING

WHY IS 42 THE ANSWER TO EVERYTHING

WHY CAN'T NOBODY ELSE LIFT THORS HAMMER

WHY IS MARVIN ALWAYS SO SAD

WHY ARE THERE ANTS

WHY IS THERE A SWARM OF ANTS

WHY IS THERE PILGRIM

WHY ARE THERE SO MANY CROWS IN ROCHESTER

WHY IS TO BE OR NOT TO BE FUNNY

WHY DO CHILDREN GET CANCER

WHY IS POSEIDON ANGRY WITH ODYSSEUS

WHY IS THERE ICE IN SPACE

WHY ARE THERE DOGS AFRAID OF FIRE

WHY IS THERE NO KING IN EN

WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE

WHY ARE THERE GODS

WHY ARE THERE TWO SPOCKS

WHY ARE MY BOOBS ITCHY

WHY ARE CIGARETTES LEGAL

WHY ARE THERE DUCKS IN MY POOL

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WHY IS THERE LIQUID IN MY EAR

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WHY ARE MY BOOBS ITCHY

WHY IS THERE A LINE THROUGH HTTPS

WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER

WHY IS HTTPS IMPORTANT

WHY AREN'T MY ARMS GROWING

WHY ARE THERE WEEKS

WHY DO I FEEL DIZZY

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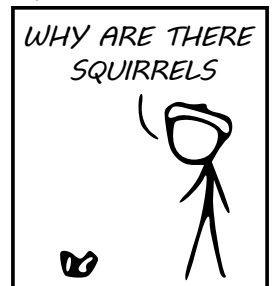
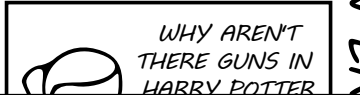
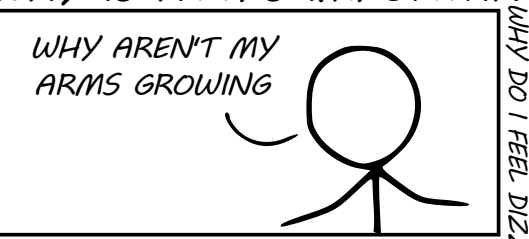
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QUESTIONS

CAN BE ASKED BY ANYONE ANYTIME

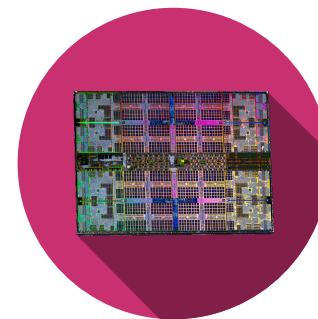




Hes·so  **VALAIS
WALLIS**



Haute Ecole d'Ingénierie
Hochschule für Ingenieurwissenschaften



Silvan Zahno silvan.zahno@hevs.ch