

AI for kids? It's possible!

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What is a kid?

Definition

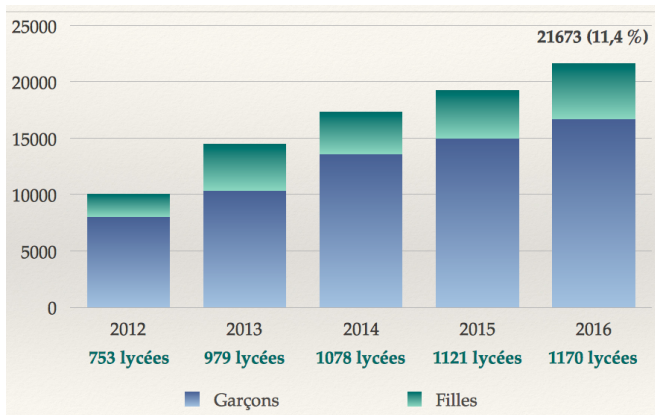
A **kid** is someone who is younger than I.

What you will see has been tested on real kids!

- ▶ Girls from 12 to 18 (Girls Can Code! summer schools)
- ▶ Students in high school (from 17 to 19)

Overview of the French CS curriculum

2012. Spécialité ISN (Informatique et sciences du numérique) en **terminale** : validation par projet au baccalauréat



Biology 38% (=) Maths 25% (↑) Physics/Chemistry 22% (↓)
Computer Science 11% (↑)

Source : Laurent Chéno, inspecteur général de mathématiques

Overview of the French CS curriculum: Python

2013. Python en classes préparatoires (remplace Maple)

- ▶ calcul numérique numpy
- ▶ bases de données SQLite

2014. Python accepté à l'agrégation de mathématiques

- ▶ algorithmique

Code instruction for non-scientists

2015. Option ICN (Informatique et création numérique) en **seconde**:

- ▶ représentation de l'information
- ▶ algorithmique / programmation
- ▶ réseaux et protocoles

(5% of the students (= 27k), in 32% of high schools (= 800))

2016. Option ICN en **première/terminale L et ES (!)**

(0,46% of the students (= 1.8k), in 6% of high schools (= 151))

Massive instruction for everyone

\o/ Scratch au **primaire/collège** !

- ▶ Introduction en CM1/CM2/6e
- ▶ Au programme de technologie **et** de mathématiques 5e/4e/3e

800k students per level!

2017. Un chapitre entier d'algorithmique dans le programme de mathématiques de **seconde** !

- ▶ Python dans les manuels

AI for kids

Requirements

- ▶ Should be simple, fun and really extensive
- ▶ Easy to prepare for us

Activities

1. Sequence generation
2. Bot tournament for simple games
3. Recommender systems (simple classifier)

Sequence generation

Simple structure

Basic rule: noun + verb + complement

Sentence generation, word by word

NO RULES.

Jump from word to word

Music composition

`https://trinket.io/music`

Machine can output absurd things, but you can improve it by adding extra constraints.

Bot tournament for games

Inspiration



Context

High school students

Feasible equivalent

15 matches (Nim game)



- ▶ Each player can take 1–3 |
- ▶ Who takes the last | loses

Demo

- ▶ All Python champions contain a single function `def ia(nb_matches)` that returns a number of matches to withdraw.
- ▶ Put in a shared folder which is the arena (Samba or DropBox).
- ▶ `python allumette.py 15 jj john`

Bot tournament for games

Benefits

- ▶ Incremental improvement of their champions
- ▶ Look at other's source code (like with Scratch)
- ▶ "I CAN BEAT ANYONE AT THIS GAME"
— Éliador, 12 years old

Movie recommendation

Inspiration

Netflix

Feasible equivalent

like/hate ratings (binary classification)

Collaborative filtering



Sacha	?	5	2	?
Ondine	4	1	?	5
Pierre	3	3	1	4
Joëlle	5	?	2	?

Collaborative filtering



Sacha	3	5	2	2
Ondine	4	1	4	5
Pierre	3	3	1	4
Joëlle	5	2	2	5

Nearest neighbors

To recommend movies to Alice (see surpriselib.com's talk yesterday):

- ▶ Introduce a **similarity score** between people
- ▶ Determine 10 people **close** to Alice
- ▶ Recommend to Alice what they liked that she did not see

Data

	007	Batman 1	Shrek 2	Toy Story 3	Star Wars 4	Twilight 5
Alice	+	-	0	+	0	-
Bob	-	0	+	-	+	+
Charles	+	+	+	+	-	-
Daisy	+	+	0	0	+	-
Everett	+	-	+	+	-	0

What similarity score can we choose?

Computing the score

	007	Batman 1	Shrek 2	Toy Story 3	Star Wars 4	Twilight 5
Alice	+	-	0	+	0	-
Charles	+	+	+	+	-	-
Score	+1	-1		+1		+1

$$\text{score}(\text{Alice}, \text{Charles}) = 3 + (-1) = 2$$

	007	Batman 1	Shrek 2	Toy Story 3	Star Wars 4	Twilight 5
Alice	+	-	0	+	0	-
Bob	-	0	+	-	+	+
Score	-1			-1		-1

$$\text{score}(\text{Alice}, \text{Bob}) = -3$$

Alice is **closer** to Charles than Bob

Similarity score between people

	Alice	Bob	Charles	Daisy	JJ
Alice	4	-3	2	1	3
Bob	-3	5	-3	-1	-2
Charles	2	-3	6	2	3
Daisy	1	-1	2	4	-1
Everett	3	-2	3	-1	5

Who are Alice's 2 closest neighbors?

Computing predictions

	007	Batman 1	Shrek 2	Toy Story 3	Star Wars 4	Twilight 5
Alice	+	-	?	+	?	-
Charles	+	+	+	+	-	-
Daisy	+	+	0	0	+	-
Everett	+	-	+	+	-	0

Knowing her neighbors, how likely Alice will enjoy these movies?

Computing predictions

	007	Batman 1	Shrek 2	Toy Story 3	Star Wars 4	Twilight 5
Alice	+	-	+	+	-	-
Charles	+	+	+	+	-	-
Daisy	+	+	0	0	+	-
Everett	+	-	+	+	-	0

Compute the mean:

$$\text{prediction}(\text{Alice}, \text{Star Wars 4}) = 0,333\dots$$

Movie recommendation

Benefits

- ▶ At least, students learn how to rely on user data to infer missing entries
- ▶ AI is not perfect but learns
- ▶ “Hey what about giving more weight to closest neighbors?”
— Clara, 18 years old

Call for activities!

- ▶ Please take something
 - ▶ that is everywhere, ex. AlphaGo
 - ▶ or what you're working on
 - and try to make a “suitable for kids” version (visual)
- ▶ Send it to us! tryalgo.org

Thanks!

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