Bæredygtig webudvikling

Introduction - why even care

Last 9 Years Warmest on Record
Global Temperature Anomaly (°C compared to the 1951-1980 average)

2022
0.89°C

Internettet udleder lige så meget CO2 som hele verdens flytrafik. Løsningen er så simpel, at alle bør kende den

Terms

- **Carbon footprint**: Total emissions of greenhouse gases (in carbon equivalent) for an activity or organisation over a given period of time.

- **Sustainability**:

  - Definition: The quality of being able to continue over a period of time:

  - The quality of causing little or no damage to the environment and therefore able to continue for a long time:

  - Sustainability is a balance of society, economy and environment for long-term resilience.

- **Greenhouse gases**: Gases that trap heat in the atmosphere including carbon dioxide, methane, nitrous oxide and water vapour.

Overview

- Design

- Accessibility

- Hosting

- Sustainable web development

Design

- The user journey also plays an important part: How much time are users spending clicking around on your site, loading more resources than they need because they can't find what they're looking for?

- Therefore simplify user experience. 2. Semester you will be learning UI and UX!

Design - Images

- Lightweight imagery

- Cutting down image size: https://tinypng.com/

- Avoid self playing videos

- Avoid gifs, use webp format instead

- Use svg instead of photos where possible

Design - Colors

- A greener design might involve using less energy-intensive colors. Blue colors use more energy than red or green do, and on Organic Light-Emitting Diode (OLED) screens

- A dark color scheme can save energy because black pixels are "off".

- https://solar.lowtechmagazine.com/

Design - Typography

- Limiting the number of web fonts we use

- Consider using a <u>variable font</u> if multiple weights and styles of a particular typeface are needed

- <u>Self-hosting your fonts</u> will save on network requests and give you more control.

Accessibility

- https://www.whocanuse.com/
- Contrast
- Color brewer 2
- Tab index
  - https://kea.dk/ is quite well done!
- Speedtests
  - https://pagespeed.web.dev/
  - Lighthouse in chrome

Hosting

- Ensuring that our web hosts use renewable energy is an important step towards reducing our sites' carbon emissions. The Green Web Foundation's hosting directory lists companies that provide proof of their "green" credentials.

- https://aremythirdpartiesgreen.com/

Sustainable web development

- Choosing efficient programming language

Table 4. Normalized global results for Energy, Time, and Memory

	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

Source: Energy Efficiency across Programming Languages, SLE'17

Sustainable web development
Reducing JavaScript usage

- Do you have to use js? http://youmightnotneedjs.com/

- https://bundlephobia.com/

Sustainable web development
Block the bots

- There are both good and bad bots. A good bot is typically owned by a legitimate company (e.g. Google or Facebook) and won't hide its identity as a bot. Good bots follow the rules and policies of your website's robots.txt file.

- https://developers.google.com/search/docs/crawling-indexing/robots/intro

-

```
User-agent: Googlebot
Disallow: /nogooglebot/

User-agent: *
Allow: /

Sitemap: https://www.example.com/sitemap.xml
```
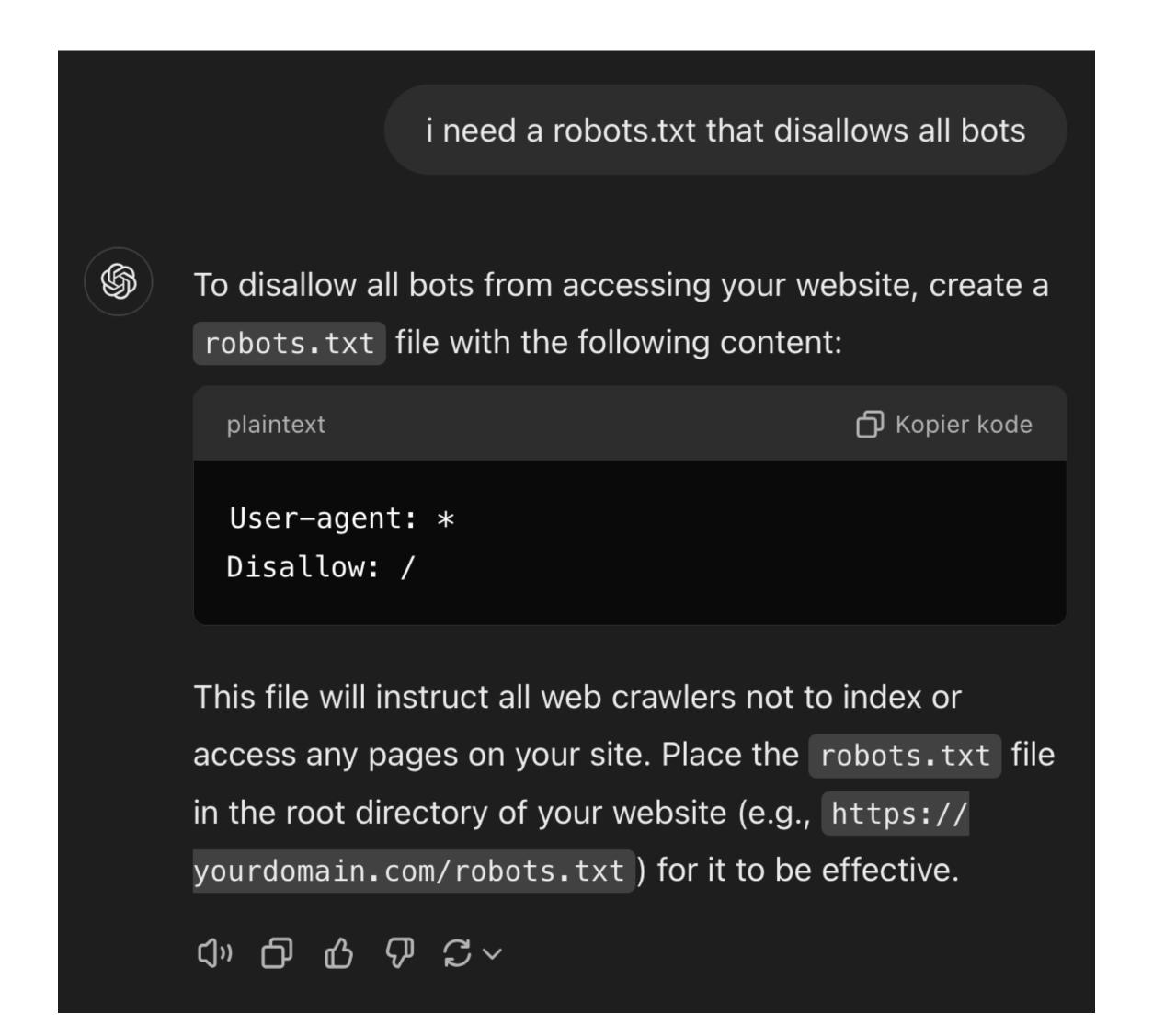
Here's what that robots.txt file means:

1. The user agent named Googlebot is not allowed to crawl any URL that starts with `https://example.com/nogooglebot/` .

2. All other user agents are allowed to crawl the entire site. This could have been omitted and the result would be the same; the default behavior is that user agents are allowed to crawl the entire site.

3. The site's sitemap file is located at `https://www.example.com/sitemap.xml` .

See the syntax section for more examples.

Sustainable web development

Block the bots

Sustainable web development
Optimization

- Minifying

- Compressing

- Tree-shaking

- https://www.uglifyjs.net/

- Reduces data transfer

- Normally done in build step

Sustainable web development

Cache

- What is a cache

- Code example of caching in NodeJS

- Code example of cache-control in node project

Exercise

1. Fork and clone this project: https://github.com/behu-kea/unsustainable-website

2. Improve the sustainability of the site using the techniques written above