eficode

Empowering Software Developers With AI-Based Coding Assistants

How GitHub Copilot makes you more productive today

Adriaan Knapen

Senior DevOps Consultant

adriaan.knapen@eficode.com

About Eficode

Eficode is the leading DevOps company in Europe.

We make software development efficient, predictable, and profitable. And enable your teams to focus on delivering the value your customers need.

Microsoft Partner
Microsoft
Gold DevOps
Gold Application Development

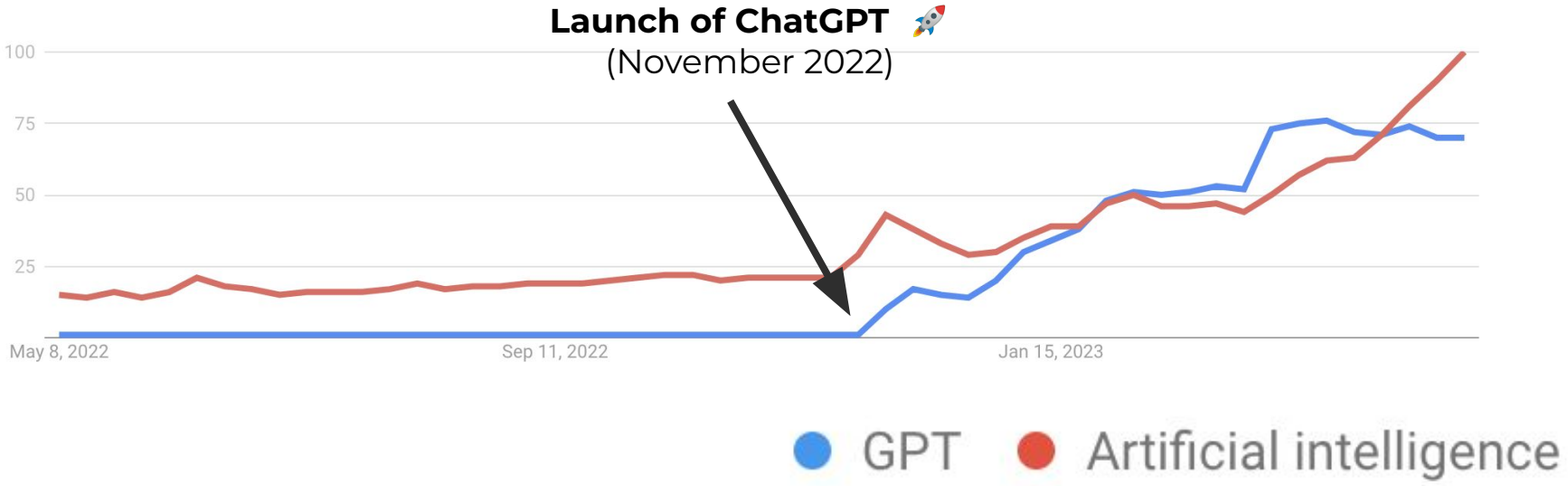
Partner

eficode

Rise of Large Language Models (LLMs)

eficode

The "AI Renaissance"



Nothing really "new"

eficode

Name	Release date[a]	Developer	Number of parameters[b]	Corpus size	Training cost (petaFLOP-day)	License[c]
BERT	2018	Google	340 million[92]	3.3 billion words[92]	9[93]	Apache 2.0[94]
XLNet	2019	Google	~340 million[96]	33 billion words		
GPT-2	2019	OpenAI	1.5 billion[99]	40GB[100] (~10 billion tokens)[101]		MIT[102]
GPT-3	2020	OpenAI	175 billion[23]	300 billion tokens[101]	3640[103]	proprietary
GPT-Neo	March 2021	EleutherAI	2.7 billion[105]	825 GiB[106]		MIT[107]
GPT-J	June 2021	EleutherAI	6 billion[108]	825 GiB[106]	200[109]	Apache 2.0
Megatron-Turing NLG	October 2021[110]	Microsoft and Nvidia	530 billion[111]	338.6 billion tokens[111]		Restricted web access
Ernie 3.0 Titan	December 2021	Baidu	260 billion[112]	4 Tb		Proprietary
Claude[113]	December 2021	Anthropic	52 billion[114]	400 billion tokens[114]		beta
GLaM (Generalist Language Model)	December 2021	Google	1.2 trillion[5]	1.6 trillion tokens[5]	5600[5]	Proprietary
Gopher	December 2021	DeepMind	280 billion[116]	300 billion tokens[117]	5833[118]	Proprietary
LaMDA (Language Models for Dialog Applications)	January 2022	Google	137 billion[119]	1.56T words,[119] 168 billion tokens[117]	4110[120]	Proprietary
GPT-NeoX	February 2022	EleutherAI	20 billion[121]	825 GiB[106]	740[109]	Apache 2.0
Chinchilla	March 2022	DeepMind	70 billion[122]	1.4 trillion tokens[122][117]	6805[118]	Proprietary
PaLM (Pathways Language Model)	April 2022	Google	540 billion[123]	768 billion tokens[122]	29250[118]	Proprietary
OPT (Open Pretrained Transformer)	May 2022	Meta	175 billion[124]	180 billion tokens[125]	310[109]	Non-commercial research[d]
YaLM 100B	June 2022	Yandex	100 billion[126]	1.7TB[126]		Apache 2.0
Minerva	June 2022	Google	540 billion[127]	38.5B tokens from webpages filtered for mathematical content and from papers submitted to the arXiv preprint server[127]		Proprietary
BLOOM	July 2022	Large collaboration led by Hugging Face	175 billion[129]	350 billion tokens (1.6TB)[130]		Responsible AI
Galactica	November 2022	Meta	120 billion	106 billion tokens[131]	unknown	CC-BY-NC-4.0
AlexaTM (Teacher Models)	November 2022	Amazon	20 billion[132]	1.3 trillion[133]		proprietary[134]
LLaMA (Large Language Model Meta AI)	February 2023	Meta	65 billion[135]	1.4 trillion[135]	6300[136]	Non-commercial research[e]
GPT-4	March 2023	OpenAI	Exact number unknown[f]	Unknown	Unknown	proprietary
Cerebras-GPT	March 2023	Cerebras	13 billion[139]		270[109]	Apache 2.0
Falcon	March 2023	Technology Innovation Institute	40 billion[140]	1 trillion tokens, from RefinedWeb (filtered web text corpus)[141] plus some "curated corpora".[142]	2800[136]	Apache 2.0[143]
BloombergGPT	March 2023	Bloomberg L.P.	50 billion	363 billion token dataset based on Bloomberg's data sources, plus 345 billion tokens from general purpose datasets[144]		Proprietary
PanGu-Σ	March 2023	Huawei	1.085 trillion	329 billion tokens[145]		Proprietary
OpenAssistant[146]	March 2023	LAION	17 billion	1.5 trillion tokens		Apache 2.0
Jurassic-2[147]	March 2023	AI21 Labs	Exact size unknown	Unknown		Proprietary
PaLM 2 (Pathways Language Model 2)	May 2023	Google	340 billion[149]	3.6 trillion tokens[149]	85000[136]	Proprietary
Llama 2	July 2023	Meta	70 billion[151]	2 trillion tokens[151]		Llama 2 license

en.wikipedia.org/wiki/Large_language_model

eficode

So not new, then why now?

- LLMs thrive on ever larger data-sets
- Moore's law ⇒ Exponential growth ⇒ "Suddenly" catches up
- Thought experiment:
  - Imagine a lake where water lilies grow
  - At day 0 - We remove all but one lily
  - At day 1 - We have 2 lilies, day 2 we have 4, ...
  - At day 30 - The entire lake is full of lilies
  - At which day is the lake half-full?

eficode

Coding Assistants in the Real World

Meet GitHub Copilot

GitHub Copilot is an AI pair programming tool

It **receives** the context of the code you are working on,
passes it to OpenAI Codex,
suggests code completions and snippets.

Purchased as a SaaS product,
licensed to individuals or business,
works as a plugin for your IDE:
- VS Code
- Visual Studio
- Neovim
- JetBrains IDEs

eficode

Coding Assistant Techniques

Amount of different techniques are growing rapidly.

- *Auto-complete on steroids:* Work like you used to, but faster.
- *Prompt through comments*: Leave a trace of documentation and utilise BDD practices
- *Create code through tests:* Utilise TDD practices and improve quality
- *Evaluate solution choices:* Rotate suggestions of the same prompt and learn about different techniques
- *Direct dialog*: Write prompts back-and-forth with the LLM model

eficode

Getting access to GitHub Copilot

Getting access to GitHub Copilot

eficode

Plug-and-play experience:

- Ensure you have a GitHub Copilot license
  - Attached to your GitHub account
  - *Business* vs. *Individual* license
- Install the Copilot add-on in your IDE of choice
  - E.g. marketplace.visualstudio.com/items?itemName=GitHub.copilot
- Authenticate and you're ready to go!

Note: Before using it on corporate code or data, make sure that this is in accordance with your security policy.

eficode

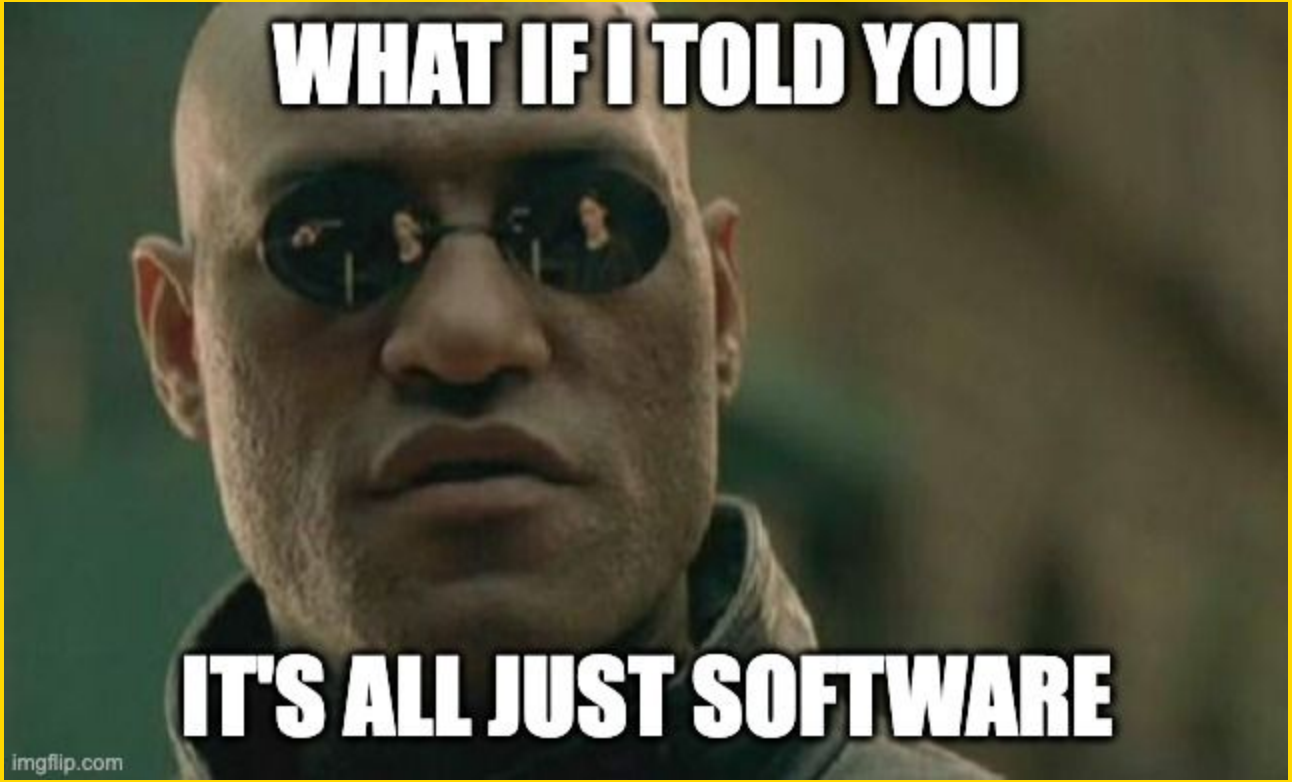
Demo time!

Let's write some code with Copilot!

eficode

What is GitHub Copilot?

For a computer


WHAT IF I TOLD YOU
IT'S ALL JUST SOFTWARE
imgflip.com

Glance under the hood

UI

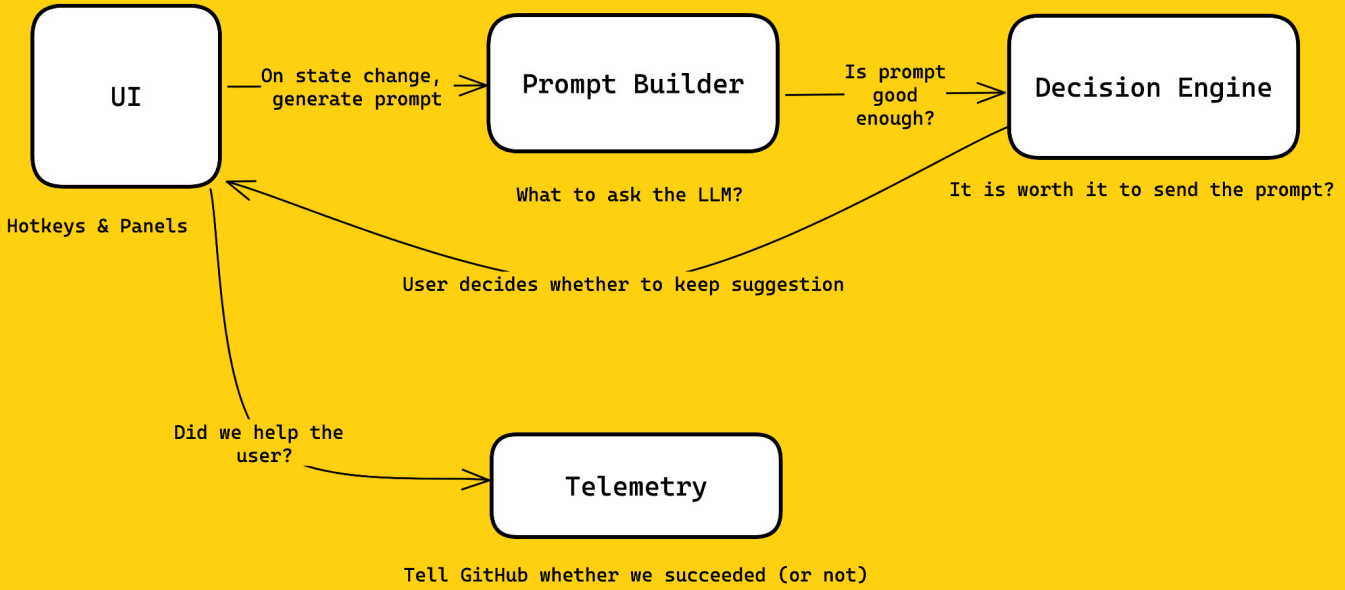
Prompt Builder

Decision Engine

Telemetry

eficode

Reverse Engineering Copilot



Full read up: https://thakkarparth007.github.io/copilot-explorer/posts/copilot-internals

eficode

Glance under the hood

UI

Prompt Builder

Decision Engine

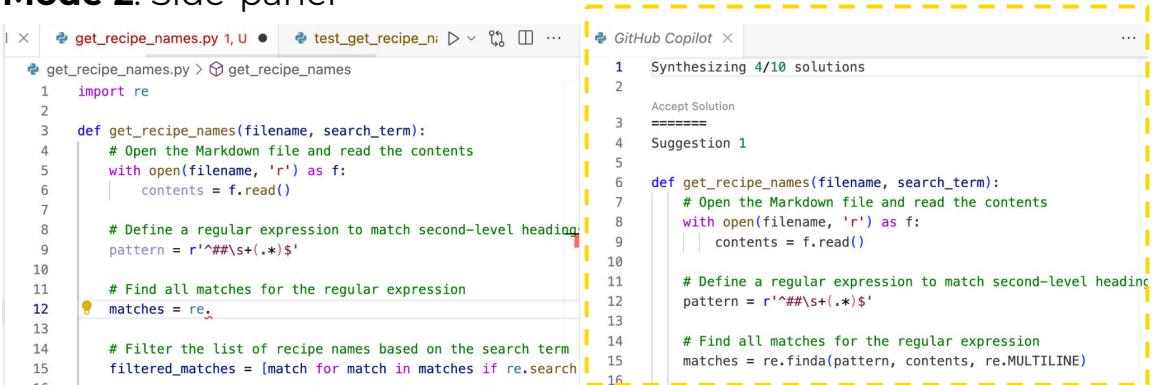
Telemetry

Reverse Engineering Copilot

Mode 1: Inline / Ghost Writer

```
11      # Find all matches for the regular expression
12      matches = re.findall(pattern, contents, re.MULTILINE)
```

Mode 2: Side-panel



Glance under the hood

UI

Prompt Builder

Decision Engine

Telemetry

Reverse Engineering Copilot

- **Goal**: Build a prompt which gives high-quality responses
- Creates an "insert-prompt"
  - Ask LLM to fill-in between two pieces of text
  - Limited prompt size ⇒ Prioritize what to keep
- Prefix
  - Current file path
  - Context, e.g. 20 recent files (only same language 🦶🔫)
  - Lines above cursor
- Suffix
  - Continue from cursor
  - Fill up remaining tokens in the prompt

Glance under the hood

UI

Prompt Builder

Decision Engine

Telemetry

Reverse Engineering Copilot

- **Goal**: "Is it worth it to fire this request to the LLM?"
- Explicit user-request? Go! 🚀
- Still typing? No go ❌
- Middle of a line? No go ❌
- Simple logistic regression model on 11 inputs, e.g.
  - Cursor location, e.g. boost for `[` or `(` versus `;])`
  - Language (e.g. `??? > js > python > rust`)
  - Accepted previous prompt?

Glance under the hood

UI

Prompt Builder

Decision Engine

Telemetry

Reverse Engineering Copilot

- **Goal**: Inform GitHub whether we were successful
- Success rate
  - Code suggestion accepted/rejected
  - Is suggested code still there after 15s, 30s, ... 10m
- "Help us improve"-snippets
  - Opt-in/out
  - Full code-snippets
  - Suggested prompts

eficode

Adriaan Knapen

Senior DevOps Consultant

Eficode

/in/adriaan-knapen

aknapen.nl

@Addono

Summary

- ➔ Coding assistants have arrived and are actually useful
- ➔ GitHub Copilot is easy to get started with today
- ➔ Gives suggestions straight into your IDE
- ➔ Helps you to
  - ◆ **Be more productive,** e.g. completing your code
  - ◆ **Write better code,** e.g. suggesting tests
  - ◆ **Enables learning,** e.g. coming up with alternative implementations or explaining what a piece of code does

eficode

Thank you!

Adriaan Knapen

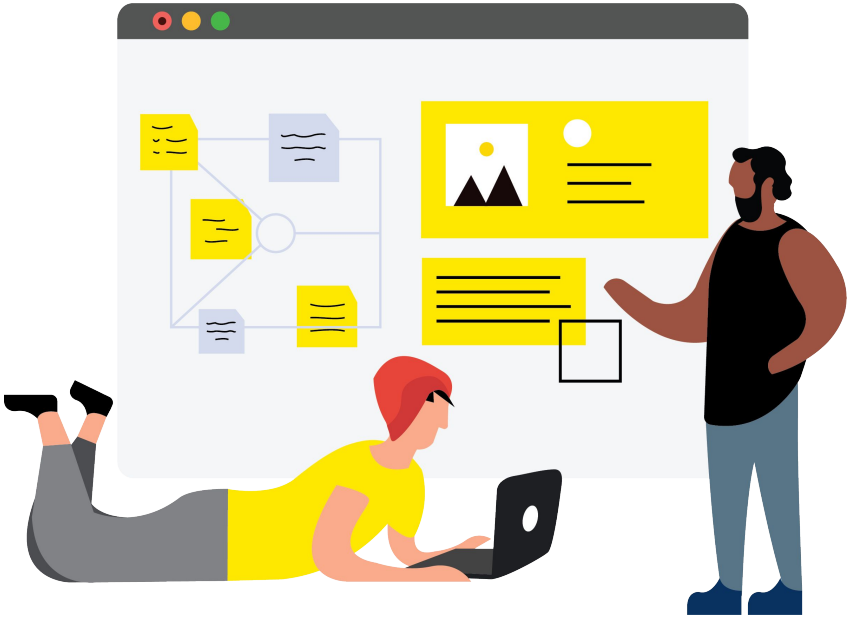
adriaan.knapen@eficode.com

linkedin.com/in/adriaan-knapen

aknapen.nl

@Addono

eficode



Headline

Subtitle

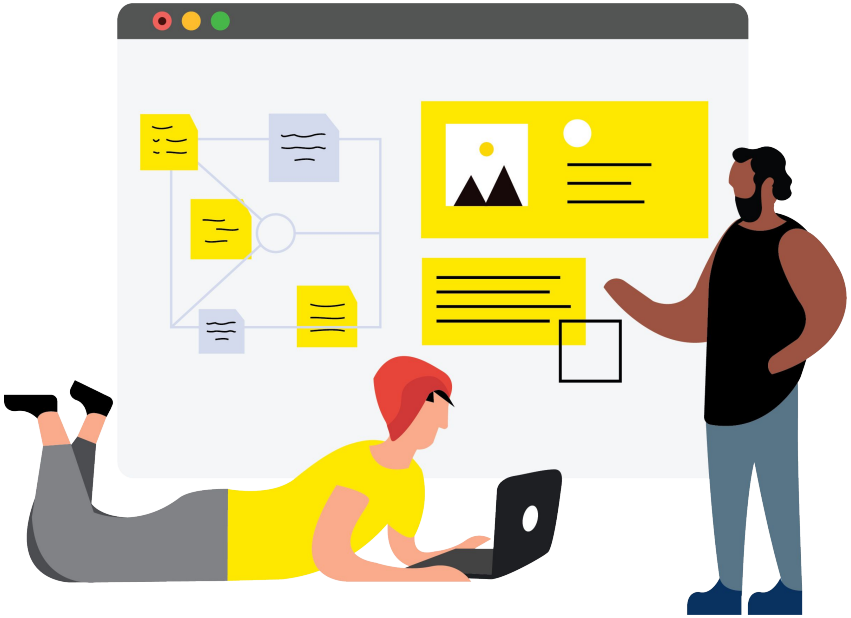
Name here

And title, or email, or insta account

eficode

Headline

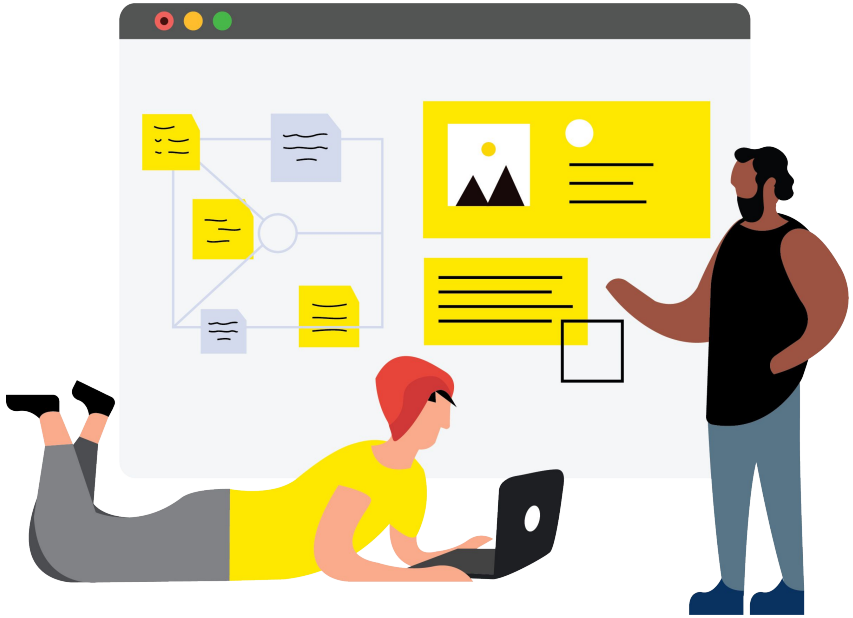
Subtitle



Name here

Topic etc

eficode



Name of the presentation

Additional info

eficode

BIG TITLE IF NEEDED

Subtitle here

Presenter / Date

eficode

Content slides

Examples of different types of content

eficode

Continuous Delivery

Continuous Delivery is an approach to software engineering that advocates short development cycles and frequent software releases that are uneventful, safe, and sustainable.

We achieve Continuous Delivery by creating automated pipelines where code is always in a deployable state.

eficode

Continuous Delivery

Continuous Delivery is an approach to software engineering that advocates short development cycles and frequent software releases that are uneventful, safe, and sustainable.

We achieve Continuous Delivery by creating automated pipelines where code is always in a deployable state.

eficode

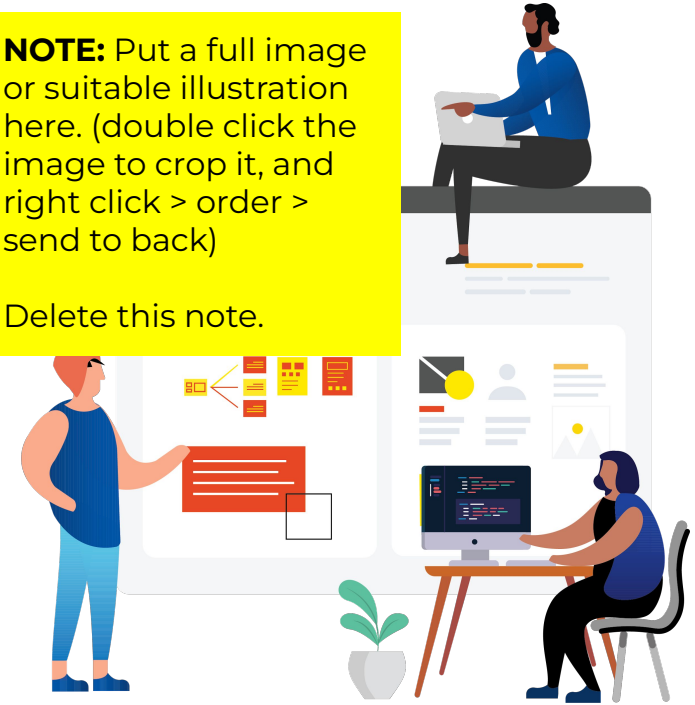
Image with gradient

Change the order of the gradient and image by moving the gradient back (Arrange > Order > Send to back), replace the image and change the order again by sending the photo to back.

eficode

NOTE: Put a full image or suitable illustration here. (double click the image to crop it, and right click > order > send to back)

Delete this note.



Keep BIG Points short and sweet. Scale to fit.

Optional small subtitle. Max 1 short sentence.

Comparison Slide

eficode

Column 1

- Lorem Ipsum is simply dummy text of the printing and typesetting industry
- Lorem Ipsum is simply dummy text of the printing and typesetting industry

Column 2

- Lorem Ipsum is simply dummy text of the printing and typesetting industry
- Lorem Ipsum is simply dummy text of the printing and typesetting industry

Three points

Vestibulum congue efficitur mi, ornare molestie elit pellentesque sed.

Dolor sit

Aenean efficitur bibendum erat, at imperdiet augue ornare quis. Duis malesuada ac orci quis semper.

Consectetur adipiscing

Aenean efficitur bibendum erat, at imperdiet augue ornare quis. Duis malesuada ac orci quis semper.

NOTE: You can copy the banner made by marketing/design to show off an event/blog post etc.
Make sure it's centered!

Delete this note.

```
For code styles and instances…


---
title: Continuous Delivery Alliance
brand-txt: "Continuous Delivery Alliance"
subtitle: 9th gathering
caption: Two days to exchange Continuous Delivery knowledge
color: '#0747A6'
# events header
event_header: /images/pages/code-alliance/alliance9.jpg
Betting on the right things is your most critical decision making ability.
```

eficode

Code example

Use this to show code examples

Master layout done

eficode

Three points, vertical

Title

My point is...

You might need to

Tweak this by hand

Third point

Or add additional points

eficode

Event Slides

E.g. Agendas, partner logo slides etc.

BREAK

- Additional text if needed

Agenda

Day 1

9:00	Welcome Keynote
11:30	The Agile Alignment Trap
12:30	Lunch
13:30	Technical Leadership in DevOps
15:00	Collaboration in AWS
16:00	Keynote

eficode

Agenda

Day 1

9:00	You can use colour to highlight
11:30	The lunch or coffeebreak
12:00	*Lunch*
13:00	Technical Leadership in DevOps
14:00	Collaboration in AWS
16:00	Keynote

Day 2

9:00	Welcome Keynote
11:30	The Agile Alignment Trap
12:00	*Lunch*
13:00	Technical Leadership in DevOps
14:00	Collaboration in AWS
16:00	Keynote

Questions or comments?

www.eficode.com

eficode

eficode

Dr. Nonexistent

email@eficode.com

+358 40 753 0283

Thank you!

Summary of points

- Donec vel laoreet tortor, vel vestibulum metus. Curabitur placerat lectus nibh, sit amet tempor
- Morbi pretium urna sed faucibus interdum.
- Donec euismod libero a hendrerit cursus
- Pellentesque aliquet dolor non orci porttitor, nec accumsa.
- Pretium urna sed faucibus interdum.
- Donec euismod libero a hendrerit cursus
- Pellentesque aliquet dolor non orci porttitor, nec accumsa.

eficode

Thank you!

First name
Last name

email@eficode.com

+358 40 753 0283

First name
Last name

email@eficode.com

+358 40 753 0283

eficode

First name
Last name

email@eficode.com

+358 40 753 0283

First name
Last name

email@eficode.com

+358 40 753 0283

First name
Last name

email@eficode.com

+358 40 753 0283

eficode

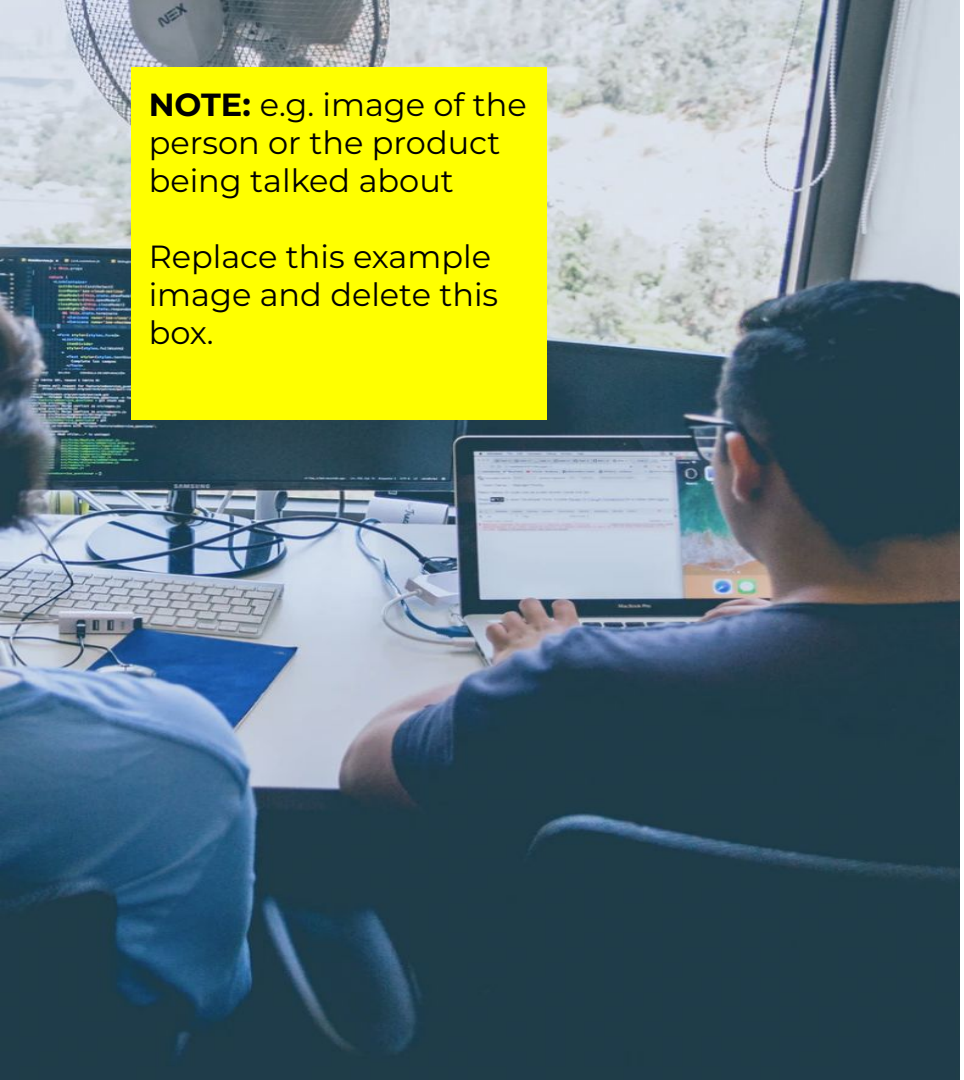
Quotes

eficode

Never deliver a presentation you wouldn’t want to sit through.

The Golden Rule of Presentations

- Nancy Duarte, Duarte Design



NOTE: e.g. image of the person or the product being talked about

Replace this example image and delete this box.

eficode

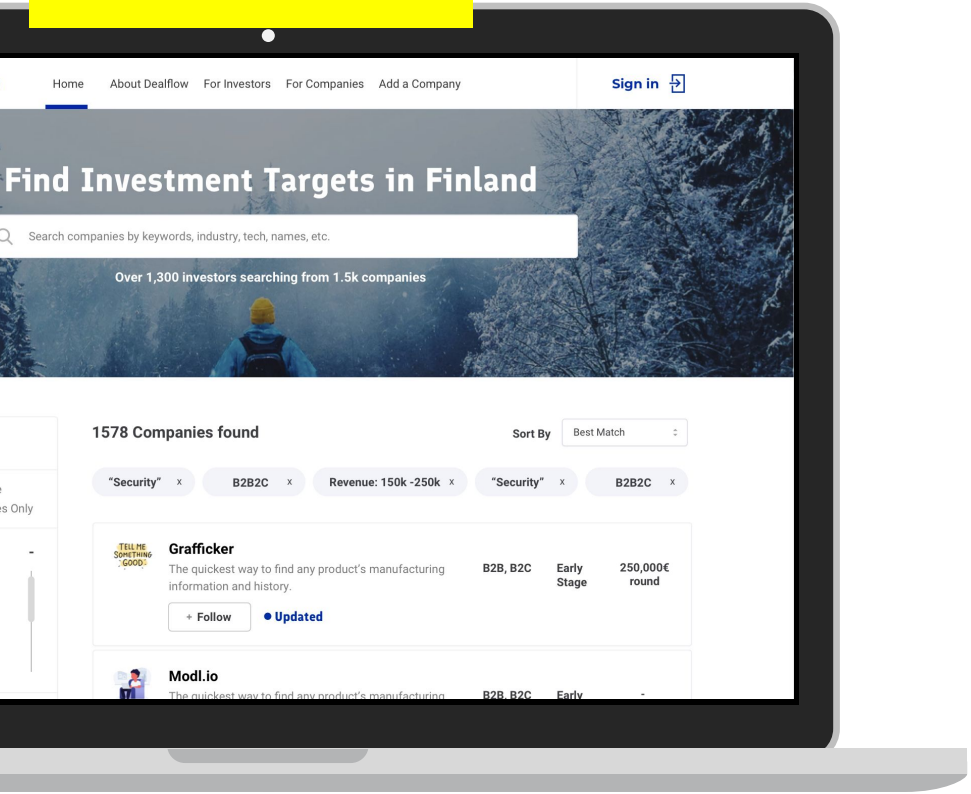
Never deliver a presentation you wouldn’t want to sit through.

The Golden Rule of Presentations

- Nancy Duarte, Duarte Design

NOTE: replace the UI shot with yours

eficode

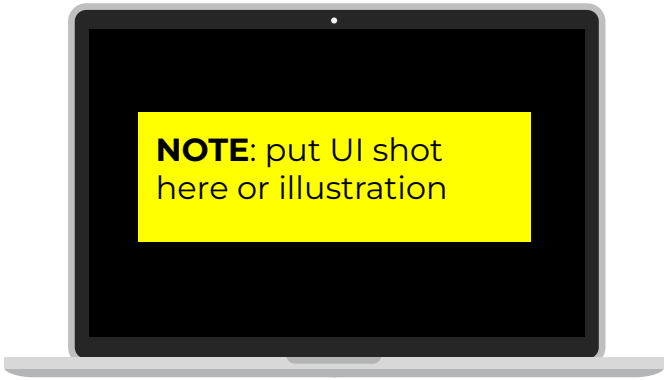


Never deliver a presentation you wouldn't want to sit through.

The Golden Rule of Presentations

- Nancy Duarte, Duarte Design

eficode



ATLASSIAN Gold Solution Partner

ATLASSIAN Training Partner

Valid until June 2019

Never deliver a presentation you wouldn't want to sit through.

The Golden Rule of Presentations

- Nancy Duarte, Duarte Design

Never deliver a presentation you wouldn’t want to sit through.

The Golden Rule of Presentations

- Nancy Duarte, Duarte Design

eficode

Section Slides

Subtitle Space

eficode

A long title space

Don’t forget to move the arrow triangle and change the font color of the active section to white. Keep the section titles short (1-2 words)

- Bullet 1
- Bullet 2
- Bullet 3

eficode

Illustration icon sections

This is arguably the most text that should ever be on one of your presentation slides. Scale up to 18 for impact.

Are they here to read or be engaged?

Don’t ask your audience to read/listen to your notes and call it a presentation. Can send them a document. Keep it short and sweet.

NOTE: You can adjust icon transparency by right clicking them -> format options -> Adjustments

Delete this note.

eficode

Illustration icon sections

This is arguably the most text that should ever be on one of your presentation slides. Scale up to 18 for impact.

Are they here to read or be engaged?

Don’t ask your audience to read/listen to your notes and call it a presentation. Can send them a document. Keep it short and sweet.

NOTE: You can adjust icon transparency by right clicking them -> format options -> Adjustments

Delete this note.

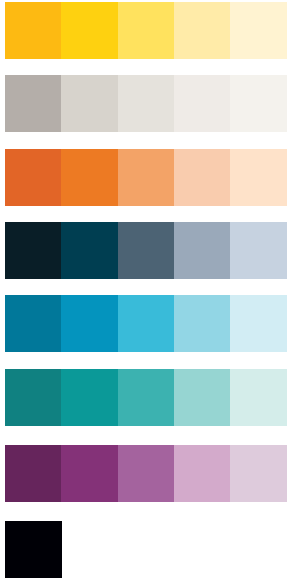
eficode

Colours

Brand Swatches

eficode

Swatches



Primary palette

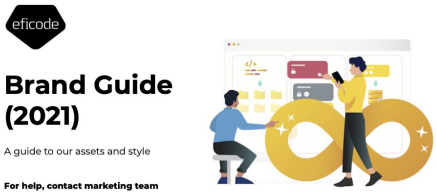
Eficode's main colors are **Almost Black, Golden Yellow and Warm Gray.**

Pantone 109 C
RGB: 255, 209, 0
HEX: #FFD100
CMYK: 0, 9, 100, 0

Pantone Black 6 C
RGB: 16, 24, 32
HEX: #101820
CMYK: 100, 79, 44, 93

Pantone Warm gray 1C
RGB: 215, 210, 203
HEX: #D7D2Cb
CMYK: 2, 2, 6, 7

Background colour

Background Colour 2

See our brand guidelines for more fun about our brand.