

State of .NET

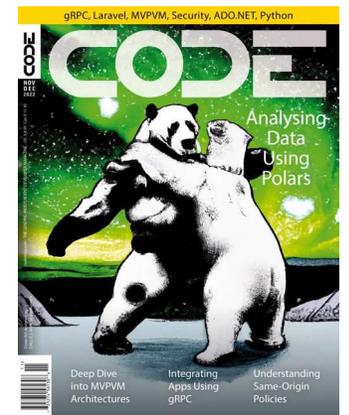
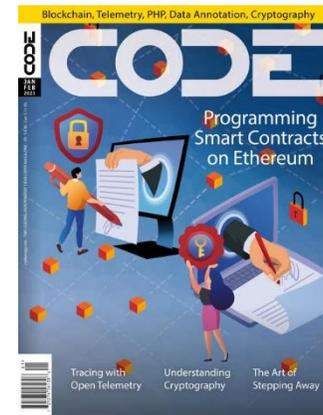
State of CODE

Markus Egger

President and Chief Software Architect
CODE Magazine, CODE Consulting, CODE Staffing

About Me

- **Markus Egger**
- President and Chief Software Architect
EPS Software Corp. (dba CODE Consulting)
- CEO – CODE Staffing
- Publisher – CODE Magazine
- International Author and Speaker
- Microsoft RD (Regional Director)
- Microsoft MVP 1995-2019
- [Email: markus@codemag.com](mailto:markus@codemag.com)
- Twitter: @markusegger



About CODE Group

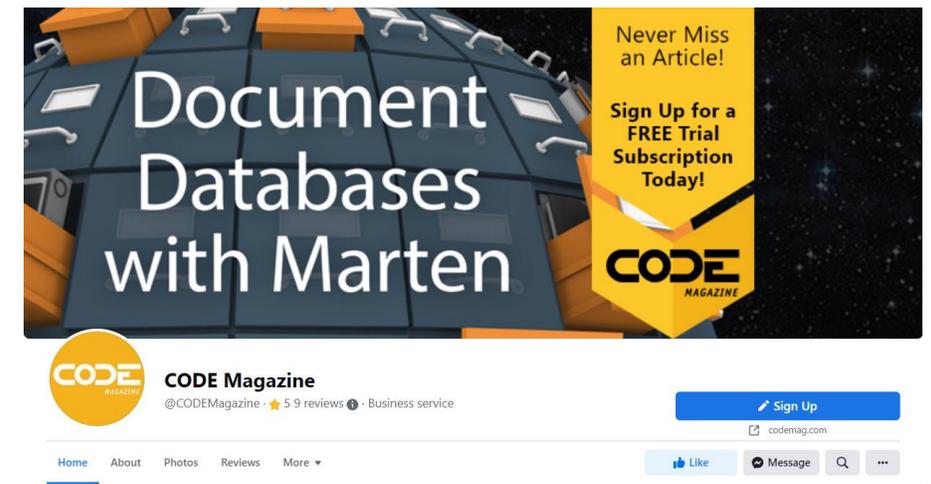
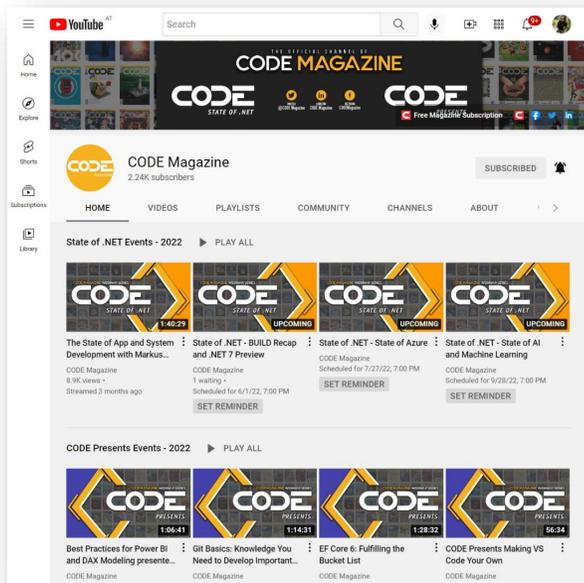
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- Custom Software Development, Training, Mentoring,...
- Web, Cloud, Mobile, Desktop, Serverless, Databases,...
- Application Security Testing & Developer Training
- User Interface and Interaction Design
- Project Rescue, App Modernization,...
- Strategic Staff Augmentation



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- State of .NET Webinar Series
 - <https://www.codemag.com/StateOfDotNet>
- CODE Presents Webinar Series
 - <https://www.codemag.com/CODEPresents>

Recent Event Recordings

State of .NET - The State of .NET App and System Development 2/23/2022	State of .NET - .NET Conf Recap 11/17/2021
	
State of .NET - .NET 6 Preview 10/27/2021	State of .NET - Azure Architecture 9/29/2021
	

Agenda

- Where are we at with .NET?
- Where are we at with Azure?
- Where are we at with AI?

.NET 7

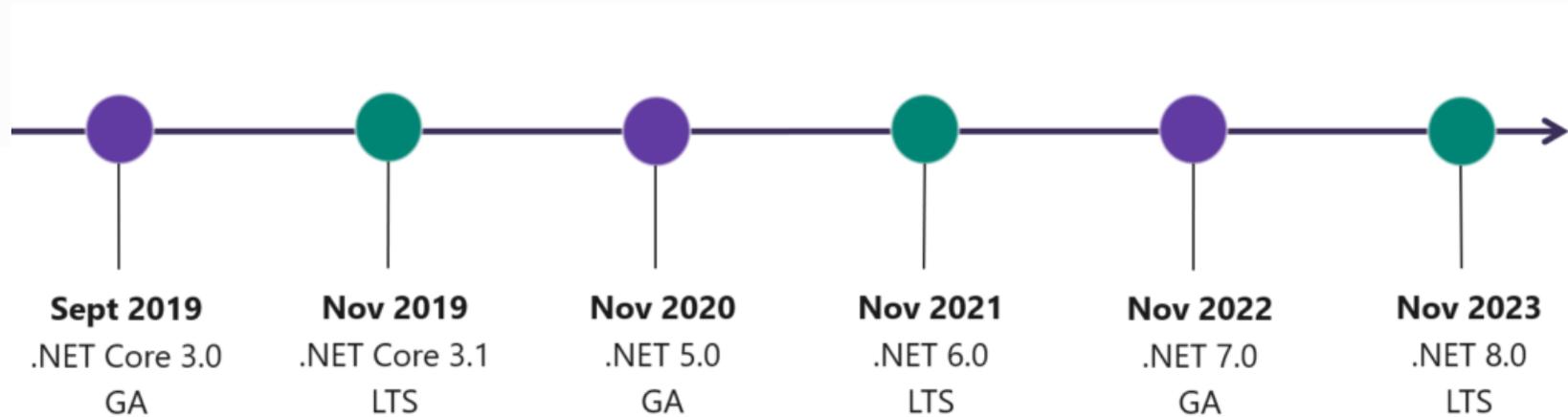
The .NET Vision

One .NET from Desktop, to
Web, Mobile, and Beyond!

The Journey to One .NET

- .NET now looks back at a history lasting two decades...
- ...with many twists and turns
- .NET Framework, .NET Core, Mono, Xamarin, UWP, Silverlight, Windows Phone,...
- Different components, project structures, APIs,...
- .NET 5/6/7 complete the journey to reunification of the .NET platform
- The goal is to get away from worrying about “what runs where” and simply “targeting .NET” with code that runs everywhere

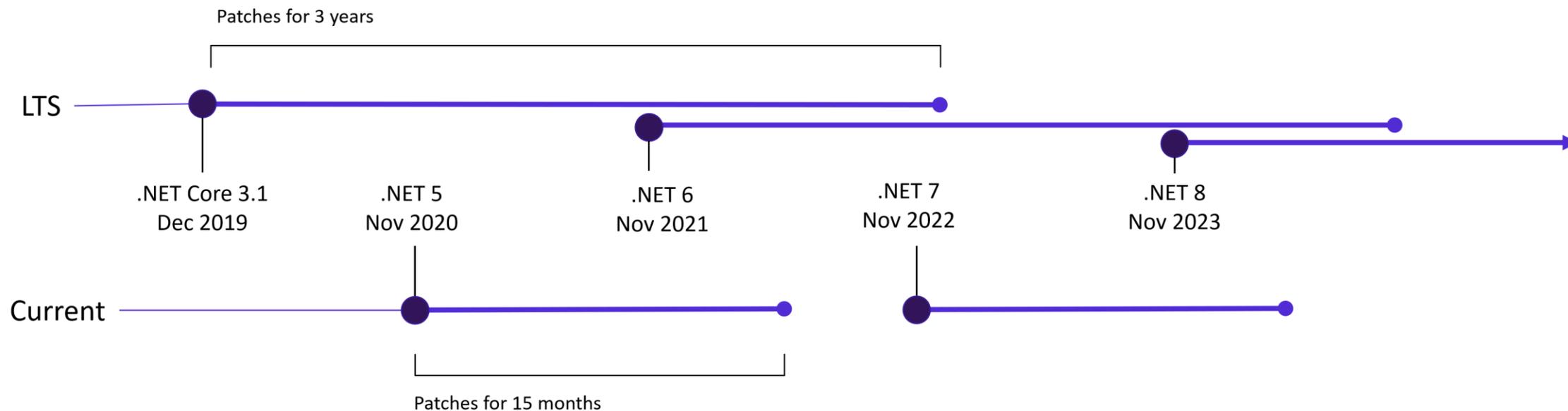
.NET Timeline/Roadmap



- .NET 7 Release: November 8th, 2022
 - DotNetConf – www.dotnetconf.net
- Azure services now support the new .NET 7 release
- Annual, predictable releases (started with .NET Core 3.1)
 - Minor Releases if needed



GA/Current vs. LTS



- Current versions (GA) are supported 15 months
 - (3 months after the next version's release date)
- LTS versions are supported for 3 years
- It should be easy to update from GA to LTS versions
- *Note: Since .NET 6 is a "LTS" version, lots of ".NET 7 technologies" target .NET 6 as a minimum version*

.NET – A unified platform



.NET ecosystem momentum

> 6M

.NET developers

In Visual Studio family

#1

Most Loved Framework (2019 & 2020)

.NET Core

Top 30

Highest velocity OSS projects

github.com/dotnet
github.com/aspnet



Top 5

Language on GitHub

C#



7X

Faster than Node.js

ASP.NET Core

70%

Using Visual Studio or VS Code

.NET 7 – Major Themes

- Performance
 - Simplification & Productivity
 - Build Modern Apps
 - Cloud-native Apps
- *My assessment: .NET, as well as building blocks (such as C#), are very mature products, and new features are very welcome, but not disruptive or world-changing*

Visual Studio

- Visual Studio release now coincide with .NET releases
- Visual Studio 2022 17.6 is currently available as a preview version

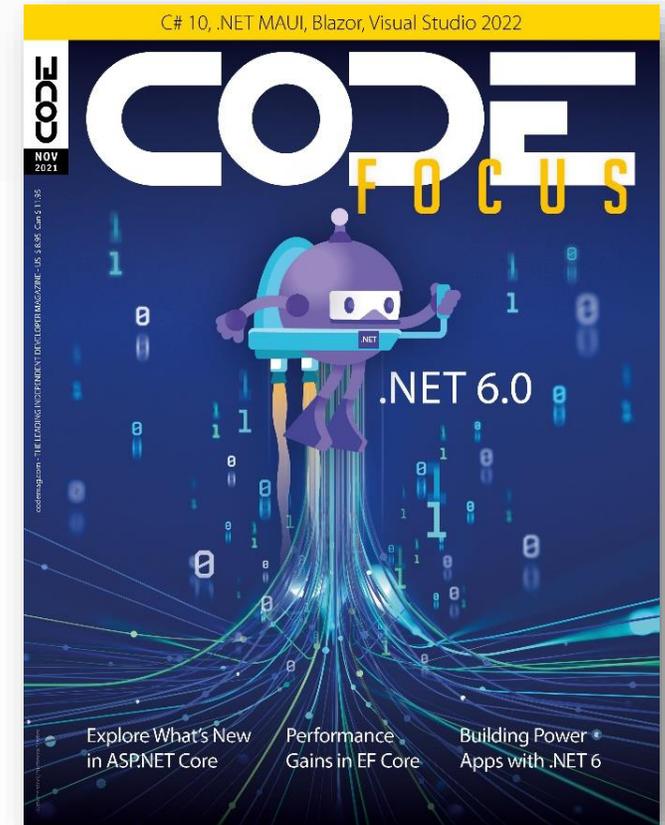
Side-Note: CODE Focus Magazine - .NET 7

- We created CODE Focus issue on .NET 7
- Great source of free information
- Produced in conjunction with Microsoft
- All CODE Magazine subscribers get this special issue for free
- Get a free subscription at:
www.codemag.com/subscribe/CF2022



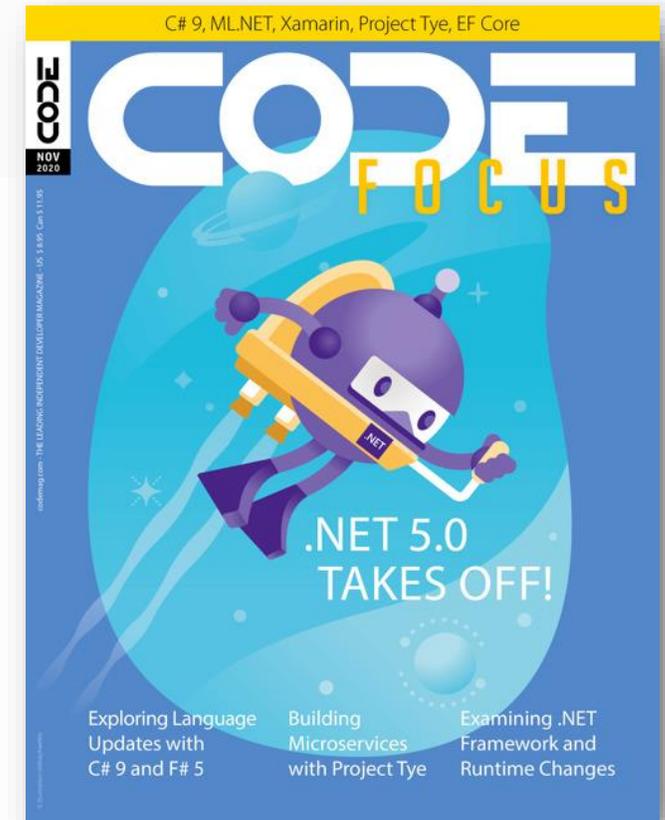
Side-Note: CODE Focus Magazine - .NET 6

- We also created a CODE Focus issue on .NET 6
- This is still available, free of charge, online
- www.codemag.com/focus



Side-Note: CODE Focus Magazine - .NET 5

- The same is true for our .NET 5 issue
- Content is still available online and very applicable today
- www.codemag.com/focus



C# 11

Major Themes in C# 11

- Improved developer productivity
 - Object initialization and creation
 - Generic math support
 - Runtime performance
- *Note: Quite a few C# 11 features are either relatively hidden ("it now just works") or requested by the CLR team*

C# 11: Developer Productivity

- Raw string literals
- Newlines in string interpolations
- UTF-8 string literals
- Pattern matching `Span<char>` and `ReadOnlySpan<char>`
- List patterns

Object Initialization

- Required initialization fields:

```
public class Person
{
    public required string FirstName { get; init; }
    public required string LastName { get; init; }
}
```

Performance



Performance Overview

- .NET 7 – surprise! – is faster than .NET 6, which was faster than .NET 5, which was faster than... well...you get the idea 😊
- Many of the performance features are not specifically driven by the developer, but instead are baked in

Compilation Details

- JIT Compilation is great...
- ...but also has downsides, such as slower startup speed
- Tiered Compilation is a great compromise between JIT and native code
 - This has been introduced in .NET Core 3.0 and has been steadily improved since then

Performance Demo

- I recommend watching the recording of the October 2022 State of .NET webinar for some cool performance demos



Upgrade Tooling



Upgrade Tooling



Upgrade Assistant

Upgrade Process

Prepare

- Review dependencies
- Choose target .NET platform
- Upgrade to NetFx 4.8?
- Order projects

Upgrade project

- Update csproj format
- Update NuGet references

Upgrade source

- Config files
- Xaml, cshtml, etc.
- Static content
- Cross-cutting concerns like auth

Test and deploy

- Test for runtime differences
- Deploy on-prem or in the cloud

CoreWCF

CoreWCF 1.x

- CoreWCF is a Microsoft-lead community project
- V1.0 is now in **supported** production release
 - The current version is actually v1.3.2
- Provides many WCF server-side features in .NET 6 **and** .NET 7
- Requires relatively minor code changes in the hosting environment, but likely not in the actual service implementation

.NET MAUI

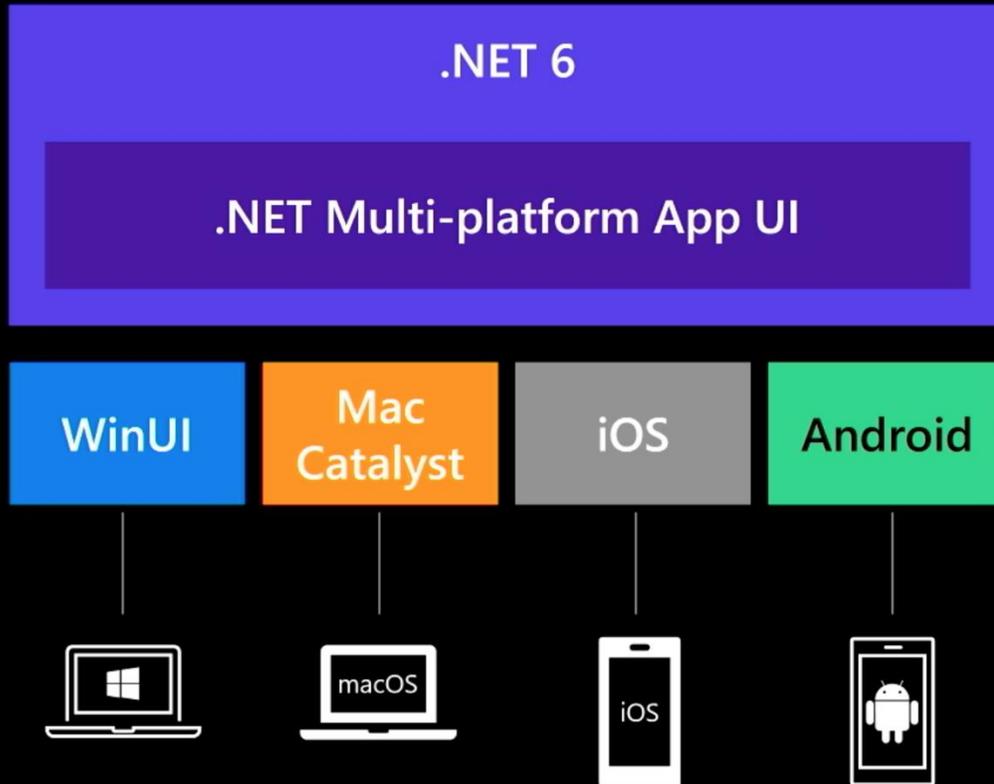


.NET MAUI

A tropical beach scene with palm trees, a sandy shore, and a blue sky with white clouds. The text is overlaid on the top left and middle left of the image.

- .NET Multi-Platform Application UI
- An evolution of the Xamarin.Forms Toolkit
- XAML-based development experience for rich applications
- Supported on Android, iOS, macOS, and Windows
- Access to each platform's native features

.NET Multi-platform App UI



- Cross-platform, native UI
- Single project system, single codebase
- Deploy to multiple devices on mobile and desktop
- First official release last April
- <https://github.com/dotnet/maui>

Blazor

What is Blazor?

- A web development framework (from Microsoft)
 - Deployed in a variety of ways, such as client-side and server-side
- Originally conceived based on WebAssembly
- Turns out to be a compelling web development framework, whether you use it with WebAssembly or otherwise

The State of Blazor



Blazor has become a mature product...



...with the incremental updates you would expect



There are new features and new project templates



Blazor components can now be used in other JavaScript frameworks, such as Angular, Vue.js, REACT,...

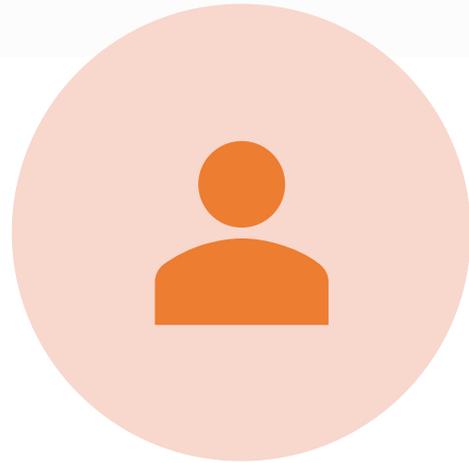


However, the most exciting news around Blazor is the ability to use Blazor in hybrid scenarios, especially (but not only!) MAUI

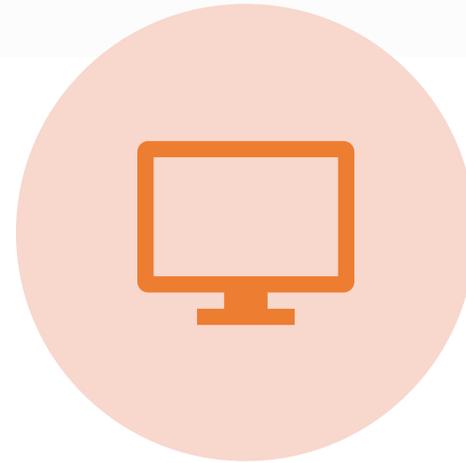
Other Technologies



Other Technologies Worth Mentioning



ENTITY FRAMEWORK CORE 7



DESKTOP DEVELOPMENT
WITH WPF AND WINFORMS

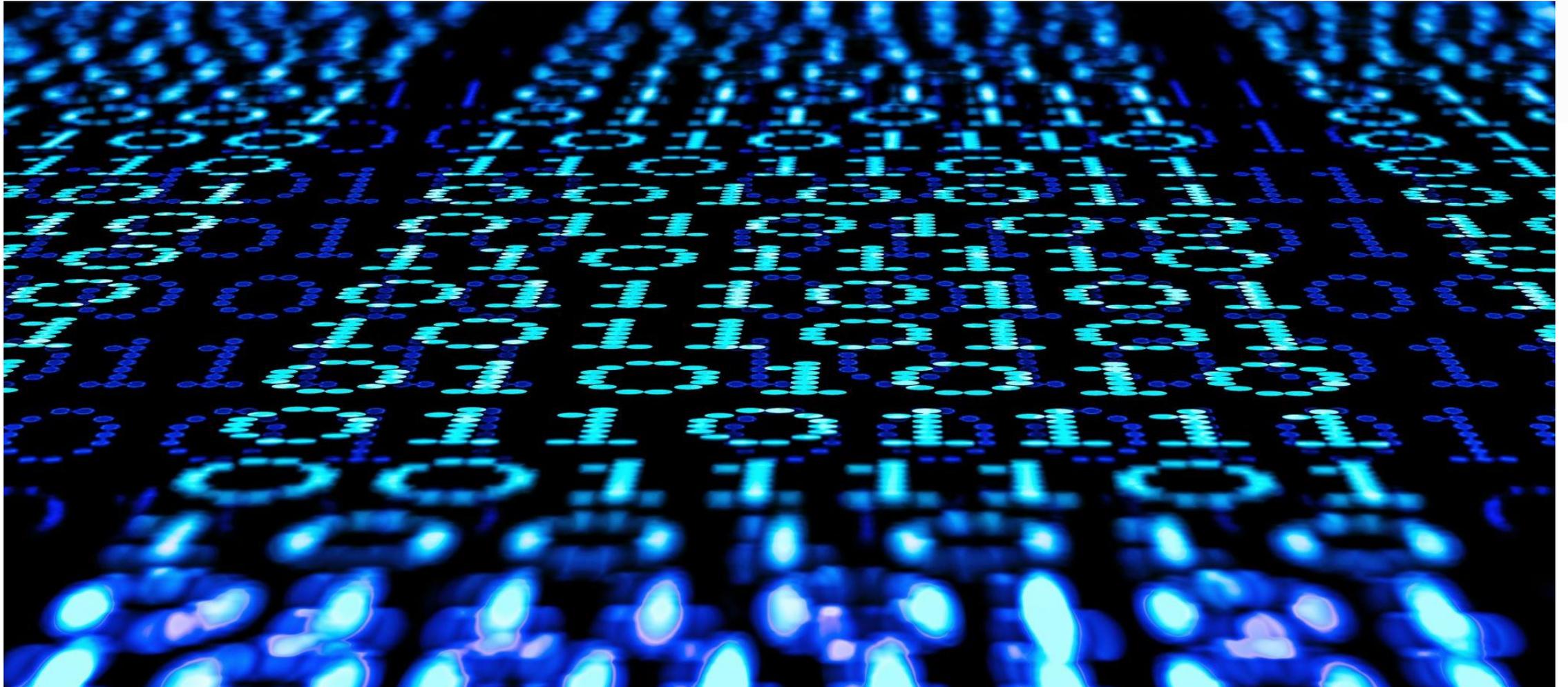
.NET 8



.NET 8 will be released in November 2023

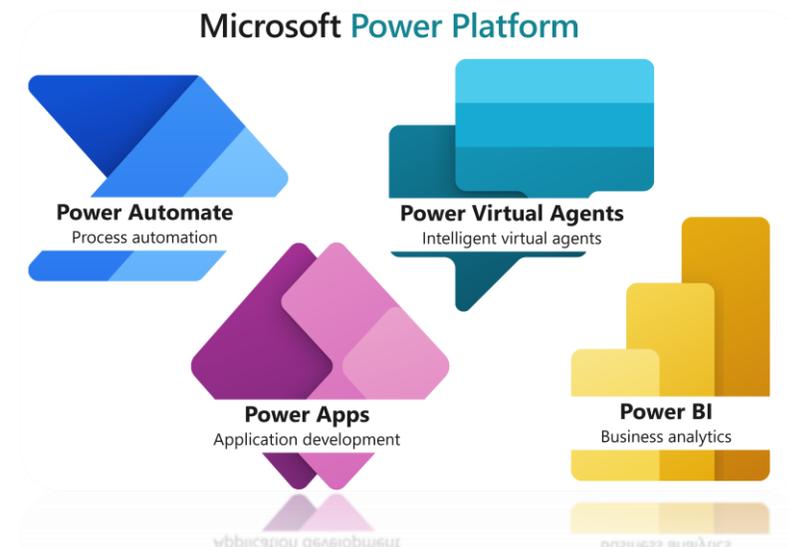
- This will be an LTS release (“Long Term Support”... 3 years)
- Currently available as Preview 3
- Features are much as expected:
 - Performance improvements (JIT and AOT)
 - .NET Container Images
 - Improvements to framework types and languages
 - C# 12
- Your .NET 5/6/7 apps will just work

Low-Code/No-Code



Low-Code/No-Code

- Most needed apps will never be built, since nobody has enough resources
 - Just in the US alone, there is a shortage of 4 million developers!
 - 500 million apps to be built in the next 5 years
- Low-Code platforms enable non-developers to build some things
- One possible technology for this is the Microsoft Power Platform
- We see it as an addition to the toolbelt, that's especially useful for UI development (and a few other things)
 - This works especially well with AI and Copilots, which extends Power Platform into "no-code"



Azure Cloud



Azure Continues to Grow in Importance!

- 65+ Regions
- 200+ Data Centers
- 150+ new Data Centers planned in the next 18-24 months
 - At current pace, a new Data Center is finished every 3 days!
- The scale of some of these data centers is mind-boggling



Break



AI Overview

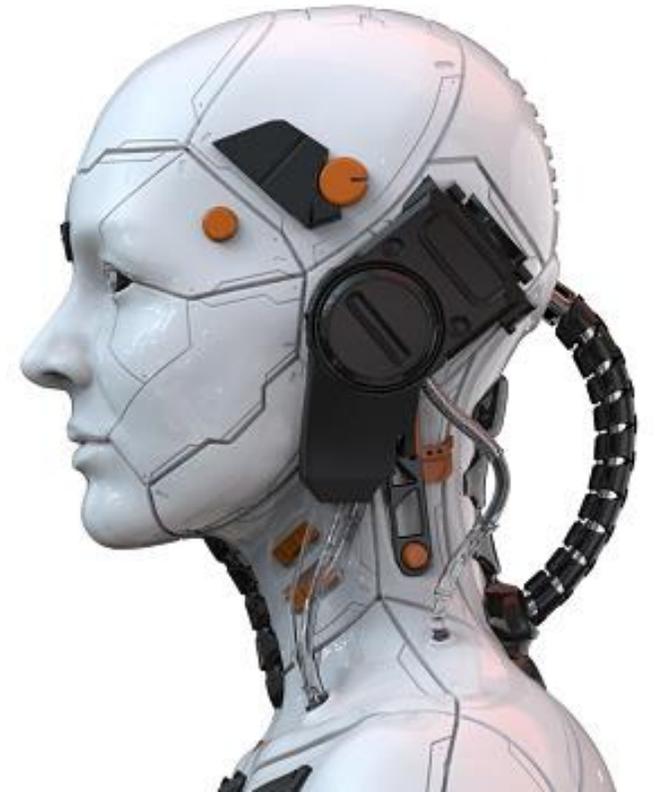


What is Artificial Intelligence and ML?

- The ability of a machine to perform “intelligent” tasks
- But what is “intelligent” in that sense?
- What is “intelligence” in any sense?

- “AI” is often described as “what’s just beyond what machines can do today”

- Today, we are generally talking about mathematical models and pattern matching



Examples of Computers being “Intelligent”

- Searching for data
- Playing Chess or GO
- Predicting user input
- Predicting the stock market
- Visual & audio recognition
- Machine translation
- Writing legal contracts

The Waves of Artificial Intelligence



Internet AI



Business AI



Perception AI



Autonomous AI

Different Types of AI

“Dumb” AI

Shallow Learning

Deep Learning

Narrow AI

General Artificial Intelligence

“Superhuman Intelligence”

- What does it mean to be “generally smarter than humans”?
 - Faster?
 - More memorization?
 - Considering more factors?
 - More complex?
 - More accurate?
 - Better pattern matching?
 - Fewer errors?
 - Self-aware?
 - Scalability?
 - ...
- Will we get there? When? Does it matter?
- *Note: It seems to me, we are even lacking proper vocabulary to discuss this issue at any depth*

Is Artificial Intelligence Dangerous?

- The “Singularity”
- Run-Away General Artificial Intelligence
- What today’s (and tomorrow’s) AI is **NOT**:
 - It’s not generally intelligent
 - It’s not conscious or self-aware
 - It’s not cunning
 - It doesn’t appreciate humor
 - It doesn’t have its own goals
 - It doesn’t have feelings, empathy, love, or appreciate beauty
 - It’s not self-motivated or driven by its own agenda
 - It’s not a person

AI and Robotics

- We are much further along in AI than in corresponding robotics
- Calculating what “should be done” in the world (such as performing a physical task) is more realistic than having a robot perform that task
- Once an AI algorithm is created, it can be shared worldwide and inexpensively... creating corresponding robots is expensive and time consuming

Adopting Things for AI

- Does Artificial Intelligence really need to be like Human Intelligence?
- Examples:
 - Perhaps it would be better to create different road networks than to make AI operate on roads made for humans
 - Perhaps it would be better to create new construction techniques than to make AI work like a human construction worker

AI Impact on the Economy

- Estimates and timeframes for AI replacing human jobs vary greatly
- A rough average seems to be that by 2040-2050, about 50-60% of current jobs can be replaced by AI
 - Whether they will be, is a different question
- The expected characteristic is that mainly the “middle” will be affected, while low-skill and high-skill jobs should be around longer
- Clearly, this will have an extreme impact on society

Factors on “Winning the AI Game”



DATA, DATA, DATA, AND
MORE DATA (FREELY
AVAILABLE)



AVAILABILITY OF
COMPUTE POWER (CLOUD
AND OTHERWISE)



FUNDING AND
ENTREPRENEURSHIP

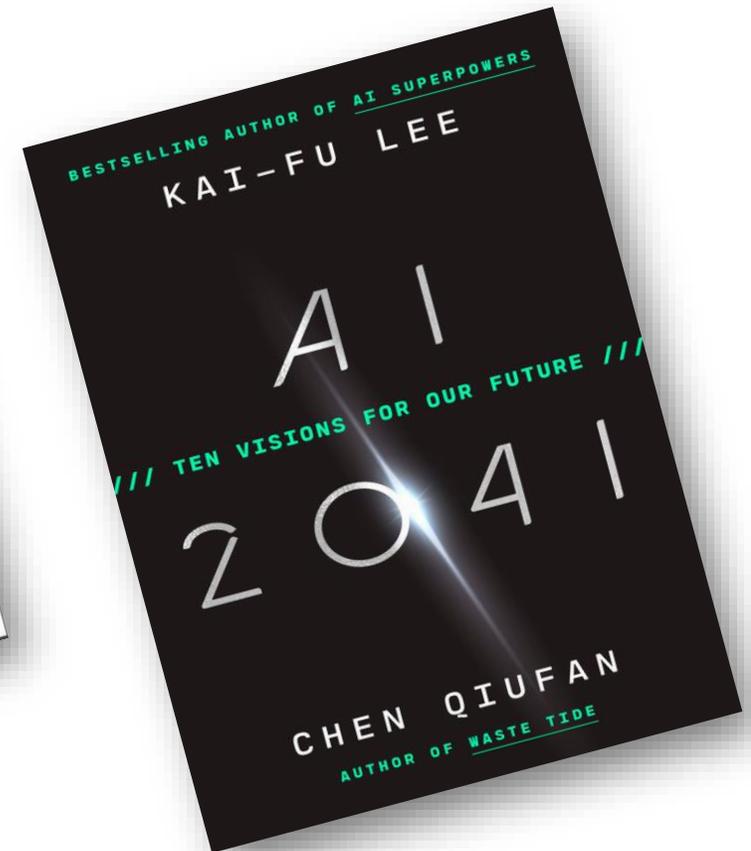
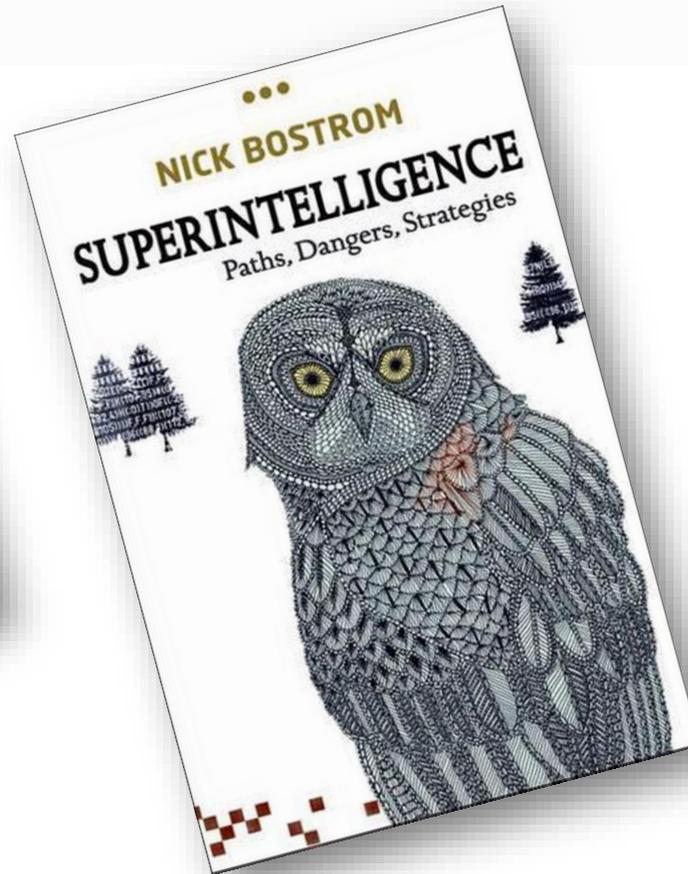
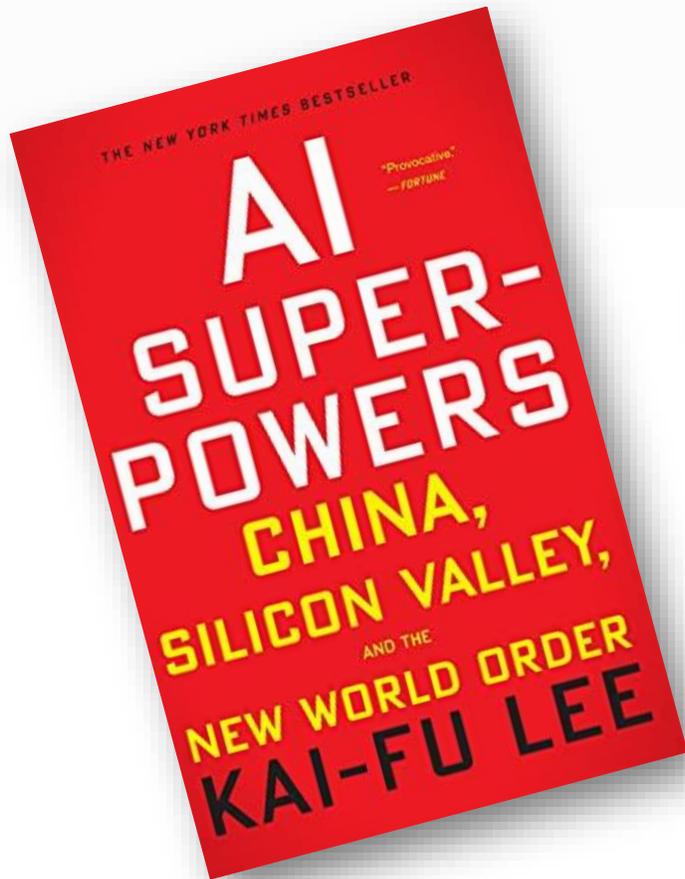


WELL-TRAINED AI
SCIENTISTS



A SUPPORTIVE POLICY
ENVIRONMENT

Recommended Reading



AI & Machine Learning in Practice Today

Our Capabilities Today

- Narrow Learning (Deep and Shallow)
- No real General Artificial Intelligence
 - Although that term is also used in confusing ways
 - I also question whether “general” AI is all that critical for our purposes
- The results we can already achieve are both mind-boggling and very practically useful

Using AI Today



**BUILT INTO APPS AND
SERVICES**



**DEVELOPING AGAINST
PRE-TRAINED AIS**



**TRAINING YOUR OWN
AIS**

Azure Cognitive Services

- Speech
 - Speech to text, text to speech, translation, speech and speaker recognition
- Language
 - Sentiment analysis, translation, question answering, conversation, reco,...
- Vision
 - Computer vision, custom vision, face recognition
- Decision
 - Anomaly detection, content moderation, personalization
- Azure OpenAI Services

Azure Applied AI Services

- Azure Form Recognizer
- Azure Metrics Advisor
- Azure Cognitive Search
- Azure Immersive Reader
- Azure Bot Service
- Azure Video Analyzer

ML.NET

- Machine Learning library for .NET developers
- Supports shallow and deep learning for narrow models
- Execution and training in all .NET applications
- Great for developers who already know .NET
- Support for model standards, such as ONNX or TensorFlow

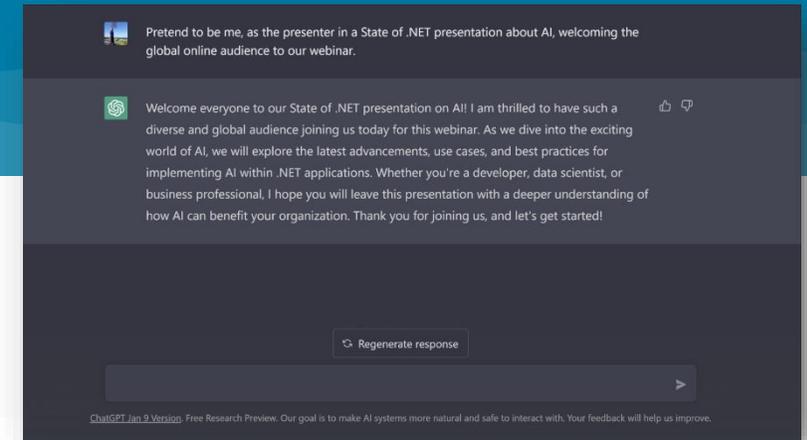
Github Copilot

- Github Copilot assists in writing code
 - Now used by over 1 million developers
 - Productivity gains of more than 50%!
-
- Check out the recording from our State of .NET Webinar and on our YouTube channel!

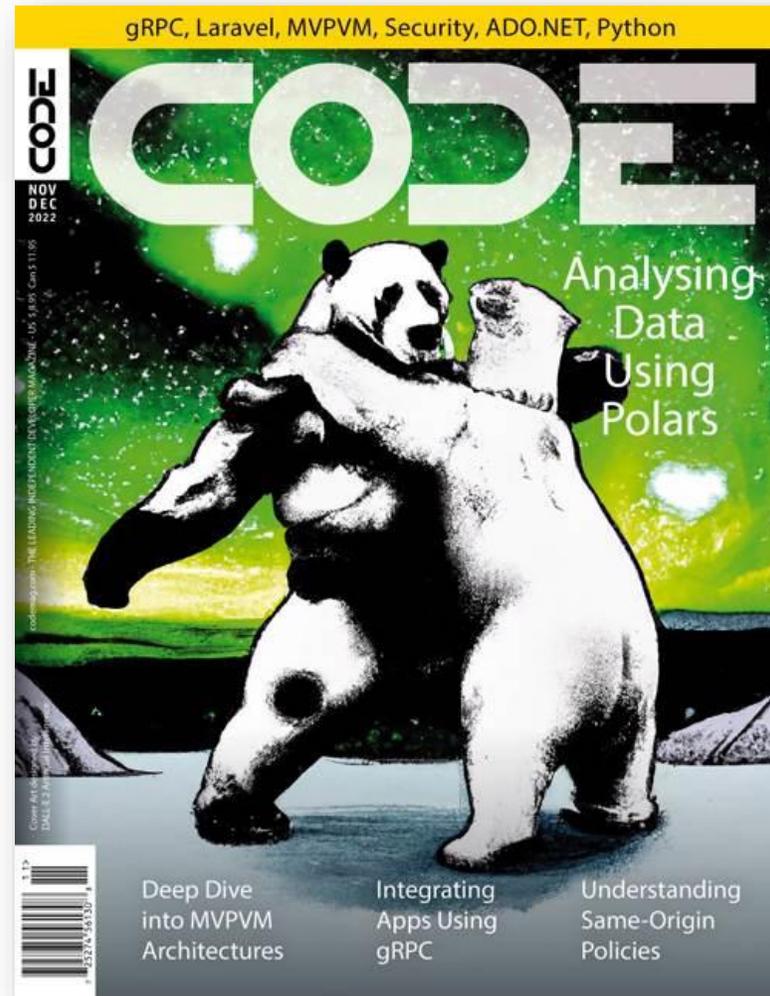


OpenAI's ChatGPT

- *GPT = Generative Pre-Trained Transformer
- You have probably heard about this 😊
 - Although just very recently
- A technological leap that forms the basis for a lot of new tech
- Note that this is just a "text calculator"... just a very good one 😊
 - The result is that this does a lot more than was anticipated, even by the creators
- Microsoft is very heavily invested

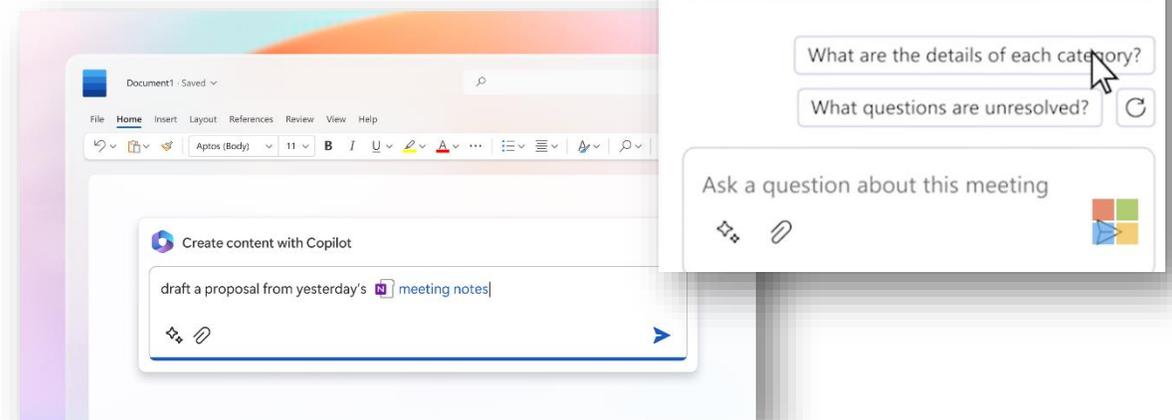


Open AI – DALL-E 2



Microsoft Copilot

- Microsoft is now introducing Copilot features in practically all applications
- Copilots are expected to drastically improve productivity
 - They already are today!
- <https://news.microsoft.com/reinventing-productivity/>



Resulting Characteristics of Copilots

- Drastically improved productivity
 - Expected to improve 50%+ every year!
- Every year, twice as good. Every year, 1/10th of the cost.
- The situation is evolving extremely fast.
 - Faster than the Web wave was.
 - Faster than the Mobile wave was.
- We just went from “Software is eating the world!” to **“AI is eating software!”**.

Resulting Characteristics of Copilots (cont.)

- We are only at the very beginning of all this. We are basically dealing with the AI equivalent of toddlers 😊
- No true Singularity will result from this, but...
 - ...this may well be the start of drastic societal changes that makes the Industrial Revolution look like child-play.
 - ...AI may create security and regulatory nightmares

**All apps without Copilot features
are essentially legacy!**

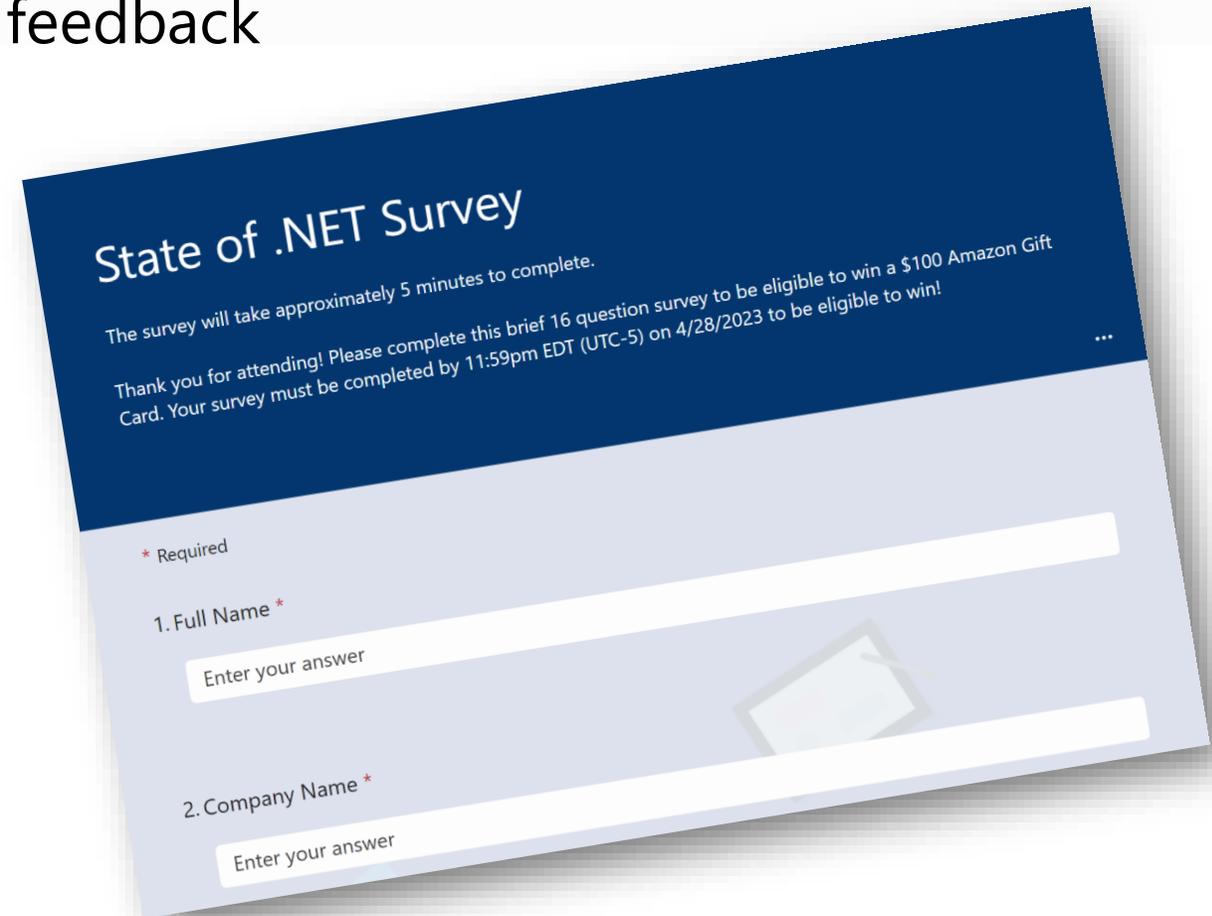
Azure OpenAI

- OpenAI features are now available to use in our own applications through Azure OpenAI
 - You can currently sign up for approval
- This provides an API that allows us to create our own Copilot-style features

Other Announcements

Event Survey – Win \$100!

- We will send you a follow-up email with an event survey
- It helps us a lot to fill it out and provide feedback



The screenshot shows a survey form titled "State of .NET Survey". The header is dark blue with white text. Below the title, there is a message: "The survey will take approximately 5 minutes to complete." followed by "Thank you for attending! Please complete this brief 16 question survey to be eligible to win a \$100 Amazon Gift Card. Your survey must be completed by 11:59pm EDT (UTC-5) on 4/28/2023 to be eligible to win!". The form body is light blue and contains two required text input fields. The first field is labeled "1. Full Name *" and the second is labeled "2. Company Name *". Both fields have a placeholder text "Enter your answer". There is a small icon of a gift card in the background of the form.

State of .NET Survey

The survey will take approximately 5 minutes to complete.

Thank you for attending! Please complete this brief 16 question survey to be eligible to win a \$100 Amazon Gift Card. Your survey must be completed by 11:59pm EDT (UTC-5) on 4/28/2023 to be eligible to win!

* Required

1. Full Name *

Enter your answer

2. Company Name *

Enter your answer

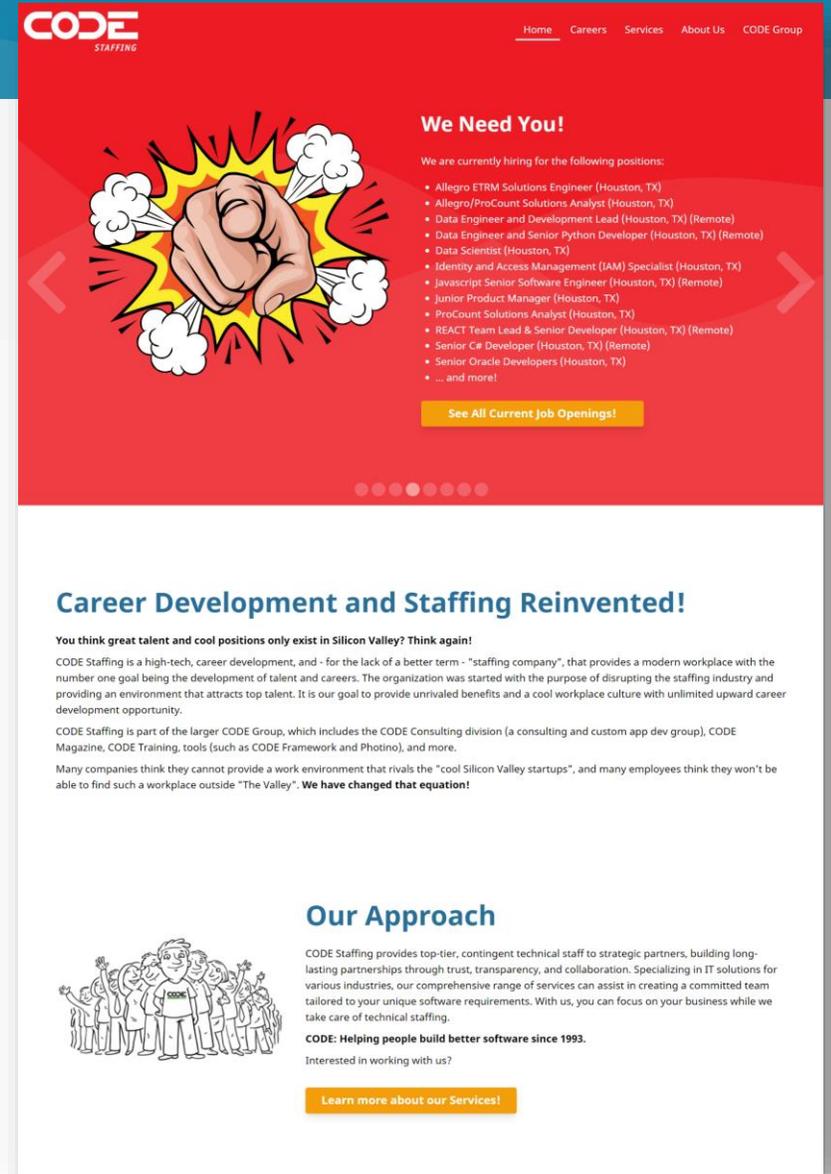
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- We are Hiring! Join the CODE Team!
- Junior to Senior roles
- FTE and/or contract
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- Especially looking for people in Texas!
- <https://codemag.com/jobs>
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Announcing: CODE Staffing

- **Disrupting** the broken staffing industry
- Our business is **career development**
- www.codestaffing.com



The screenshot shows the CODE Staffing website homepage. The top navigation bar includes links for Home, Careers, Services, About Us, and CODE Group. The main content area features a red background with a central illustration of a clenched fist breaking through a yellow starburst. To the right of this illustration is the heading "We Need You!" followed by a list of current hiring positions: Allegro ETRM Solutions Engineer (Houston, TX), Allegro/ProCount Solutions Analyst (Houston, TX), Data Engineer and Development Lead (Houston, TX) (Remote), Data Engineer and Senior Python Developer (Houston, TX) (Remote), Data Scientist (Houston, TX), Identity and Access Management (IAM) Specialist (Houston, TX), Javascript Senior Software Engineer (Houston, TX) (Remote), Junior Product Manager (Houston, TX), ProCount Solutions Analyst (Houston, TX), REACT Team Lead & Senior Developer (Houston, TX) (Remote), Senior C# Developer (Houston, TX) (Remote), and Senior Oracle Developers (Houston, TX), along with "... and more!". A yellow button below the list says "See All Current Job Openings!". Below this section is a white background with the heading "Career Development and Staffing Reinvented!". The text below this heading states: "You think great talent and cool positions only exist in Silicon Valley? Think again! CODE Staffing is a high-tech, career development, and - for the lack of a better term - 'staffing company', that provides a modern workplace with the number one goal being the development of talent and careers. The organization was started with the purpose of disrupting the staffing industry and providing an environment that attracts top talent. It is our goal to provide unrivaled benefits and a cool workplace culture with unlimited upward career development opportunity. CODE Staffing is part of the larger CODE Group, which includes the CODE Consulting division (a consulting and custom app dev group), CODE Magazine, CODE Training, tools (such as CODE Framework and Photino), and more. Many companies think they cannot provide a work environment that rivals the 'cool Silicon Valley startups', and many employees think they won't be able to find such a workplace outside 'The Valley'. We have changed that equation!". Below this text is another illustration of a diverse group of people. To the right of this illustration is the heading "Our Approach" followed by text: "CODE Staffing provides top-tier, contingent technical staff to strategic partners, building long-lasting partnerships through trust, transparency, and collaboration. Specializing in IT solutions for various industries, our comprehensive range of services can assist in creating a committed team tailored to your unique software requirements. With us, you can focus on your business while we take care of technical staffing. CODE: Helping people build better software since 1993. Interested in working with us?". A yellow button below this text says "Learn more about our Services!".

CODE Pilot

- Helping companies implement AI features is now a major service we offer
- This is especially true for copilot-stye features in existing and new applications
- Contact us for more information and to schedule a free demonstration and/or brainstorming session
- info@codemag.com



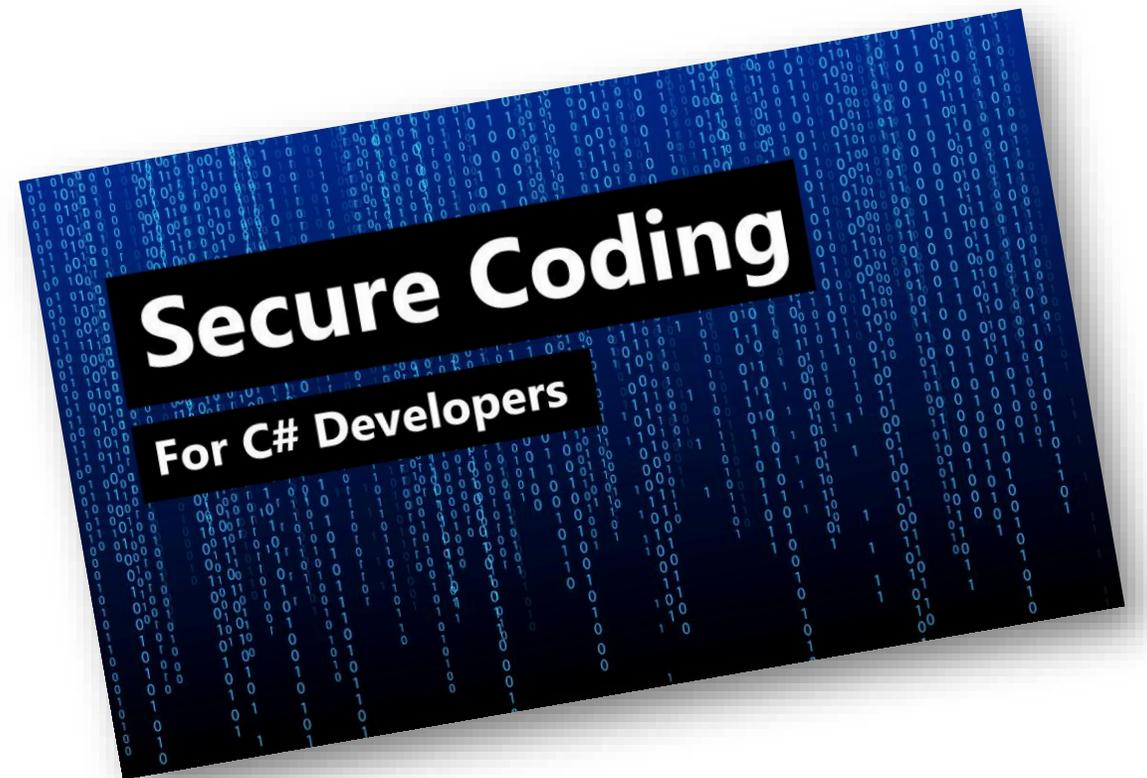
CODE Security - Application Testing Services

- Our expert consultants are experienced in identifying security vulnerabilities in your products, your services and/or your application's architecture.
- <https://codemag.com/security>



CODE Training – Secure Coding

- A new series of training classes
- Scheduled or delivered individually for your organization
- <https://codemag.com/training>



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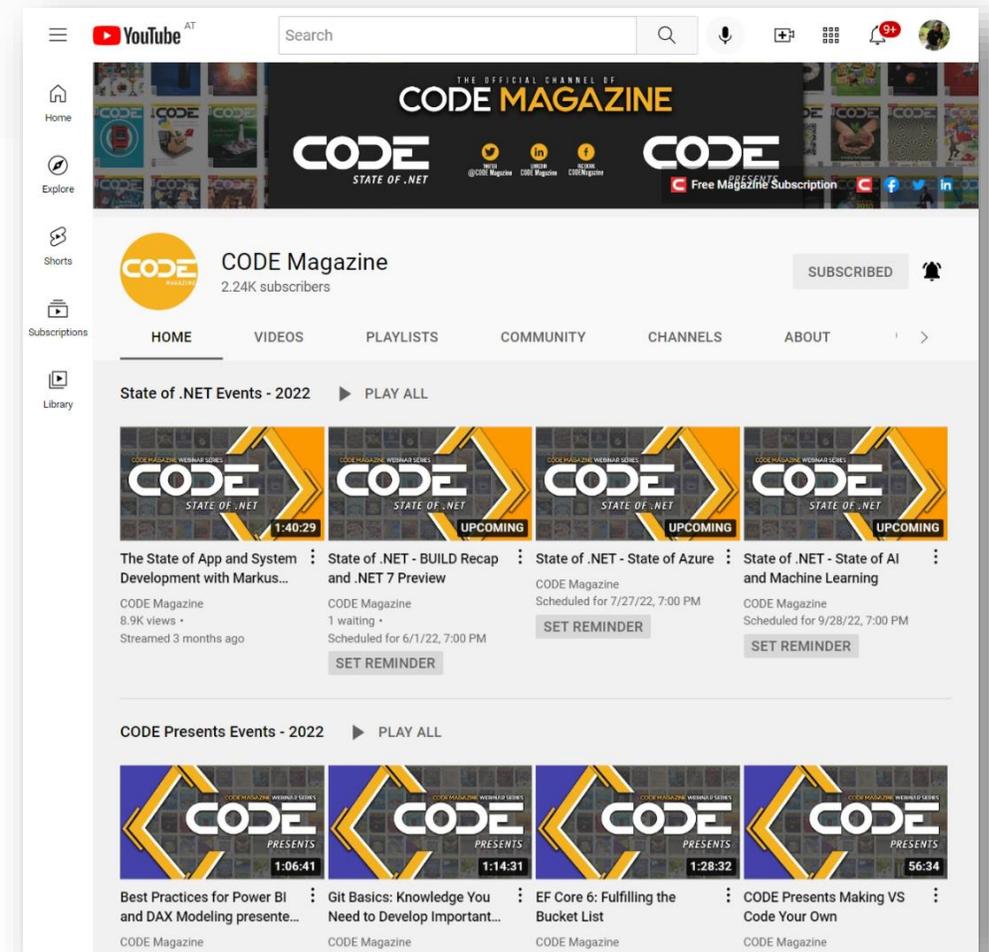
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Q&A

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