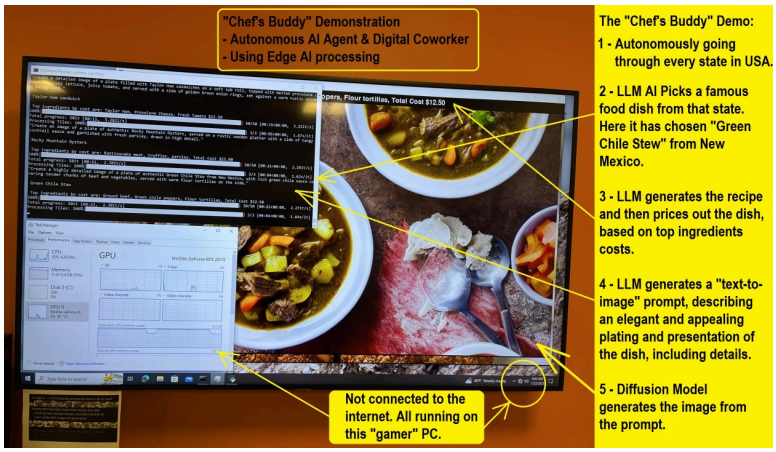


Chef's Buddy - Technical Details

Paul Nussbaum
Experienced Product Manager, Professor, Kaggle AI Expert, and NVIDIA AI Ambassador

February 13, 2025

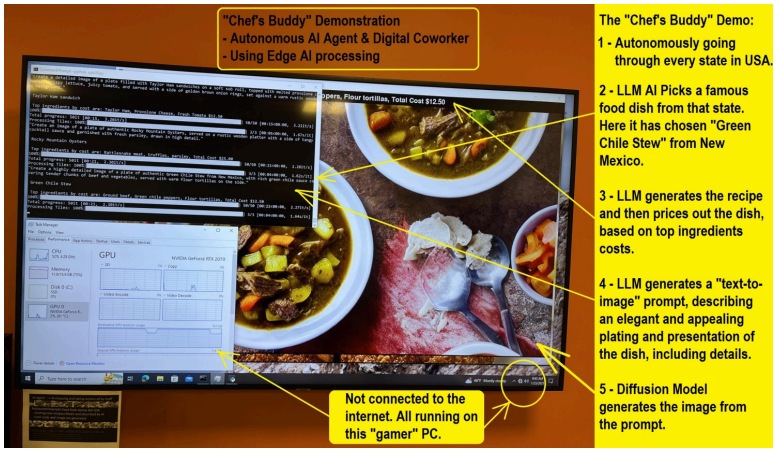
Some folks were asking me about the technical details of the "Chef's Buddy" demonstration that was part of our Culinary and Technology AI Seminar last week. You can see the article about that event here:

https://www.linkedin.com/pulse/ecpi-universitys-chefs-buddy-ai-seminar-hands-on-arts-paul-nussbaum-wajoe/?trackingId=GwuFVYd5%2FPlRu2XGO1tYyQ%3D%3D

The Culinary and Technology attendees of the Interdisciplinary Chef's Buddy AI Seminar held Feb 5, 2025, at the Glen Allen, VA campus of ECPI University

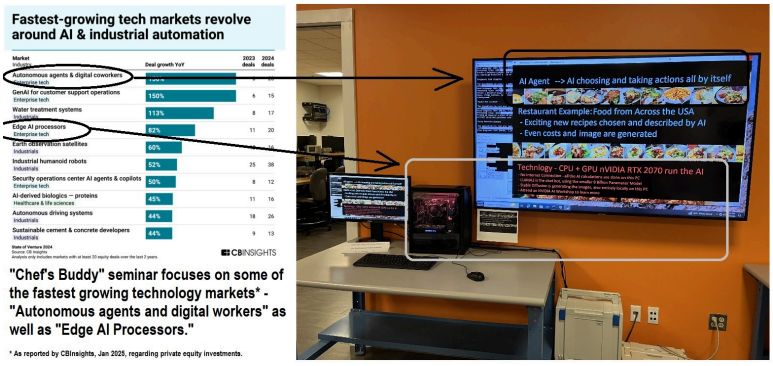
Introduction

These images and their captions describe what the Chef's Buddy demonstration does - and it does it day after day, week after week - generating new recipes, pricing, and images entirely autonomously.



1 - Goes through a list of provided locations (the 50 states). 2 - LLM picks a famous dish from that location. 3 - LLM generates the recipe and cost for the dish. 4 - LLM generates a description of plating for the dish. 5 - Diffusion Model draws it.

After the Chef's Buddy demo, culinary and technology students collaborate to gatherer requirements (and also play around with free online Generative AI tools, such as Gemini, CoPilot, and ChatGPT).



Chef's Buddy demo focuses fastest growing technology markets. 1 - Autonomous agents and digital workers (hence the "buddy"). 2 - Edge AI Processors (focusing on privacy and keeping competitive info from being used as training data and competitors)

Not much software programming was required. Most of the Python code was dedicated to the creation of the display window to combine images and text for the "endlessly running slideshow" style agentic output.

The AI agent is therefore tasked with making this never-ending slideshow - which we display near a busy hallway of ECPI University's Glen Allen Virginia campus.

Hardware Technical Details

The hardware shown in the images is a simple personal computer with a graphics card capable of running CUDA (an NVIDIA GPU) about three generations old. NVIDIA is currently shipping the five-thousand series of RTX GPU cards, and this is running on the two-thousand series (the RTX 2070 with 8Gb of video memory, to be specific). I recently bought a simple Windows 11 "gamer" laptop from Walmart (including laptop version of the four-thousand series GPU), and I was able to run this AI Agent demo on it quite easily.

Why No Internet Connection?

As a demonstration of an Edge AI Processor, I did not want to have any information travel over the internet while this particular agent is doing its work. This is in contrast to the large number of agentic solutions being proposed by the creators of these Generative AI models (like OpenAI, Google, and Microsoft). Most commercially available and publicized AI Agents are all-about collecting information from the internet but also using an internet-based cloud AI model. This allows for the access to the latest information (latest prices of ingredients, for example) but also allows for use of the AI interactions to be viewable by the vendor, possibly used for further training of the algorithms. This implies that the newly trained algorithms will have knowledge of the AI Agent's activities. Some pros and cons of no internet connection:

Cons (of having no internet connection):

- Don't have the latest information from the internet.
- Guardrails may not be present or updated with latest improvement. Guardrails prevent, for example, the image generator from creating a disgusting image that is distasteful or inappropriate. This was not an issue for this particular use case but could be for other applications.
- Uses less accurate smaller Generative AI models that can run on this hardware. As AI Models are "shrunk down" to be smaller for Edge Device implementation, methods such as pruning as well as lower numerical precision are used. The latter has the net effect of "rounding off" of the trained weights (weights are what get trained in AI).
- IMPACT - I would say the prices were the biggest impact. Too many recipes were priced out at "$12.50" showing rounding errors and lack of the most recent pricing info.

Pros (of having no internet connection):

- No monthly fee nor limit to usage when using online served AI.
- Personally Identifiable Information (PII) is not transmitted over the internet, nor is it shared with vendors and their partners.
- Business secrets are kept secret. The culinary field, and restaurants in general, are competitive. In competitive environments, businesses need to keep their "next big thing" a secret.
- AI Agent activities cannot be used to train models owned by someone else (and possibly sold to a competitor).
- People feel more comfortable interacting privately with their own AI Agent that is not connected to the internet. Not everyone wants to share what questions they asked of an AI Agent, perhaps revealing aspects of themselves they might not want to share. Students especially, who may worry about "looking dumb" or have other private aspects of their interactions be available for scrutiny, seem to appreciate this.

- IMPACT - I would say the biggest impact of the "Pros:" above is amazement. New users of Generative AI are amazed that all those "answers" are packed into a desktop personal computer.

AI Models Used

The Large Language Model (LLM) used for the text interaction is Llama3 from the Meta (Facebook) corporation. It is an open model which means you can download it and use it as you see fit, within the boundaries of the open licensing agreement. Here I used the 8 Billion Parameter model. You can see other Llama models as well as learn about their capabilities here: **www.llama.com**

- Queries were made without memory of prior chat interactions, using the role of a "user" asking a question of an "assistant."
- Prompts were carefully crafted and improved over several iterations, in particular, the prompts used to generate the image descriptive text that would later be used by the Diffusion model.

The Diffusion Model used to convert text into images was from the Stable Diffusion corporation. For this demo, a simple version 1 of the model was used, however many, many models exist, some fine-tuned for food generation. These were not used, and instead, a simple generic text-to-image model was used. You can see other Stable Diffusion models as well as learn about their capabilities here: **www.stability.ai/stable-image**

- An 800x450 pixel image was generated using the "v1-5-pruned-emaonly" model
- This was then upscaled to a 1600x900 pixel image for display on a large TV monitor using the "4x_UniversalUpscalerV2-Sharp_101000_G" model

Other Software

The Python version used was 3.10.6 for compatibility with Cuda and Pytorch (also called "torch"), which are utilities to run the model and to use the GPU hardware to do so. Torch version 2.1.0+cu118 was used. You can learn more about Pytorch and its dependencies here: **www.pytorch.org**

The ability to open a frame in Microsoft Windows, and the ability to easily draw images and text inside of that window was needed to allow this AI Agent to create the "rolling slideshow" style display. This was provided by the PyGame package, which is normally used by Python programmers to create new video games. You can see other details about this package here: **www.pygame.org**

I also had to write the Python program to run the AI agent, bringing all these parts together. A total of less than 300 lines of code was needed, including comment sections. Honestly, most of the lines of code had to do with the Windows display of the results.

No Programming Experience?

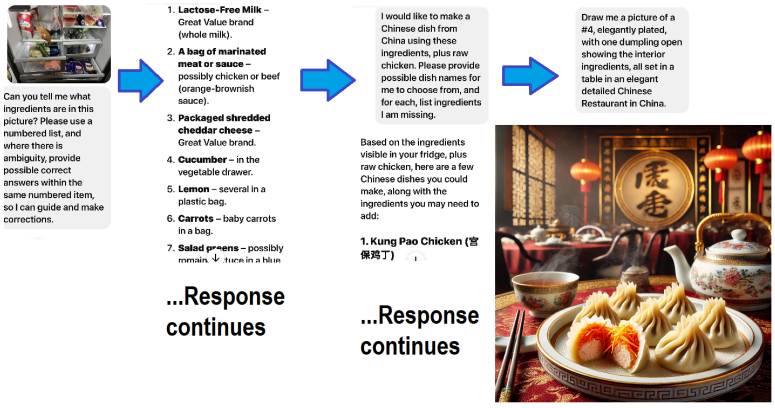
You can try out some culinary AI at home for free - no programming required. In the below example, I used the free online version of ChatGPT from OpenAI that you can find here **www.chatgpt.com**

NO PROGRAMMING EXAMPLE

1. I first took a photograph of my open refrigerator

2. I then uploaded the photo to ChatGPT and then, via text, I asked the chatbot to list the ingredients it could see
3. After that, I asked the chatbot for some recipes I could make with those ingredients, plus some uncooked chicken that I had as well. I guided it by selecting the style/region of the recipe suggestions I wanted.
4. Finally, I chose one that seemed like I could handle, and I asked the chatbot to draw me a picture of that dish

You can see the entire interaction, including the specific images and wording of the questions I asked (the "prompts") in the infographic below:



Free online tools make for a good Chef's Buddy as well!

Conclusion

I hope you enjoyed this discussion of some of the technical details of how to program your own autonomous AI agent and digital co-worker, all on an edge platform with no internet connection. I also hope that you try out some free online Generative AI solutions (that don't need any programming skills).

We gathered plenty of requirements for a future version of Chef's Buddy, so stay tuned for the next iteration!

Thanks so much to the many faculty, students, and administrative team members, without whose support I could not have developed this demonstration and seminar. They include Chef Darren Rounds CEC,CCE,CCA,CE as well as the seminar participating Culinary students, and of course the Technology Students: GENESIS HALSEY , Jordan McKoy , Martin Pinon , Steven Lemos and others. I also have a super-supportive administrative team including President Ashley Nelson Richards, Director Matt Grinsell, Ed.D. Dean Wael Ibrahim IT leaders Julian H. Aiken Jr. and others.

Here are some hashtags too: #AI #CulinaryArts #EngineeringTechnology #ECPIUniversity #CareerDevelopment #EdgeComputing #AIAgent #AgenticAI #ElectronicsEngineering #ElectronicsEngineeringTechnology #Technology

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I'll be posting the source code to GitHub and setting up a group of folks who would like to explore enhancements to the demo version of Chef's Buddy, so that we can see which of the requirements we gathered during the interdisciplinary seminar we can actually implement for our future Chef's of the world! Reach out to me directly or comment below if you'd lik ...more

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Paul thanks for including research! it makes my nerdy brain so happy to dig in!

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Paul Nussbaum
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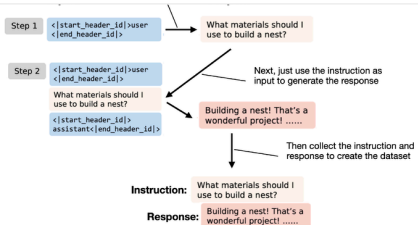

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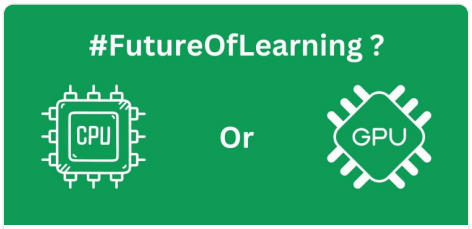

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