



## **AI IN ACTION FOR STORMWATER MANAGEMENT**

March 14, 2025 10:30 a.m. – 11:30 a.m. (Eastern)

www.florida-stormwater.org

# APPLIED SCIENCES

## OneWaterFL.com

Florida Based. Regionally Skilled.



**Florida Stormwater Association** 









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# JonesEdmunds

# AI IN ACTION for Stormwater Management

IOT

Freentine Montaling

Predictive Modeling

# **AI History**



## Ecopia AI

• 3D Land Cover Mapping

NOAA C-CAP Phase 1

- Impervious Maps
- Waterbody Maps
- Canopy Maps

## Microsoft and Google

• Building Footprints



## Ecopia AI

• 3D Land Cover Mapping

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## Esri AI Deep Learning Models

- Impervious Mapping
- Wetland Species Mapping





## Real-Time Image Interpretation

- Infrastructure Mapping
  - Curbs
  - Swales
  - Inlets
  - Manholes
- Maintenance Needs
  - Street Flooding
  - Clogged Inlets
- Pavement Conditions
- Reduced Inspection Times

## **Generative AI**



# **Generative AI**

## Anthropic: Claude's Primary Uses (December 2024)

	Acadomic Decearch & Muiting	Advanced AI/ML 6.00%	Applications	Business Strategy & Operations 5.70%
Web & Mobile App Development 10.40%	Academic Research & Writing 7.20%			
				Digital Marketing & SEO 3.70%
Content Creation & Communication 9.20%	Education & Career Development 7.10%	Language Translation 4.50%	DevOps & Cloud Infrastructure 3.90%	Data Analysis & Visualization 3.50%



# **Generative AI – Images**

Generative AI for Flood Mapping

Combine AI and physical models to develop "real" flood images

Generate Physically-Consistent Satellite Imagery for Climate Visualizations (Lütjens, et al)



# **Generative AI – Images**

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Combine AI and physical models to develop "real" flood images

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FloodGen (BetaNYC) Open-source tool to map flooding on Google Streetview imagery

## **Generative AI – FloodGen**





# **Generative AI – Videos**

Low-Cost Video Production

## **Unlimited Creativity**



# **Generative AI – Videos**

Low-Cost Video Production

Unlimited Creativity

Develop Stormwater-Focused Content



## **Generative AI – Scripting**

## GIS Script Tools

## Python

R

## Ruby

Bat Files

## PowerShell

① ChatGPT 4o ~	×	Stream Extraction Script $  imes $	୭	Ś	ð	ð	ſ	🕑 Run	ЭН
	<b>1</b> 2	<pre>import whitebox wbt = whitebox.WhiteboxTools()</pre>							
Example Task: Extracting Stream		# Define input and output file paths							
Network from a DFM Using		<pre>dem_path = "data/input_dem.tif"</pre>							
WhiteboxTools in Python		<pre>filled_dem = "data/filled_dem.tif" flow accum = "data/flow accum tif"</pre>							
Wintebox roois in Fython		<pre>streams_raster = "data/streams.tif"</pre>							
This script demonstrates how to use		<pre>streams_vector = "data/streams.shp"</pre>							
WhiteboxTools in Python to extract a stream									
network from a DEM. It performs the		<pre>wbt.fill_depressions(dem_path, filled_dem)</pre>							
following steps:	13 14	# Compute flow accumulation							
1. Fill sinks in the DEM to ensure proper		<pre>wbt.d8_flow_accumulation(filled_dem, flow_accum, ou</pre>	it_type="ce	lls")					
hydrologic flow.									
2 Colouista flow accumulation using the		<pre># Extract stream network using a threshold (e.g., i threshold = 100</pre>							
2. Calculate now accumulation using the		<pre>wbt.extract_streams(flow_accum, streams_raster, thr</pre>	eshold)						
D8 algorithm.	20	# Convert streams to vector format (shapefile)							
3. Extract streams based on a flow		wbt.raster_streams_to_vector(streams_raster, stream	s_vector,	filled	_dem)				
accumulation threshold.									
4. Convert the extracted streams to vector		print( Stream extraction completed successfully! )							
format for GIS analysis.									
python 🗗 Copy 🏷 Edit									
import whitebox									
<pre>wbt = whitebox.WhiteboxTools()</pre>									
<pre># Define input and output file paths</pre>									
<pre>dem_path = "data/input_dem.tif" file</pre>									
<pre>filled_dem = "data/filled_dem.tif" flow accum = "data/flow accum tif"</pre>									
streams raster = "data/streams.tif"									
<pre>streams vector = "data/streams.shp"</pre>									
<b>↓</b>									
# Fill sinks to remove artificial depres									
Stream Extraction Script									
Ask anything									
A deep research I									



# **Generative AI – GIS Analysis**

Perform Complex GIS Analysis with AI

Parameterize 1D Stormwater Model (StormWise / SWMM)

-Extract Stage-Storage Relationship

-LiDAR-Based DEM

-Python Script





## **Generative AI – GIS Analysis**

← C	https://chatgpt.com/?model=gpt-4o	A 1	) ເ∕≡	🥠
T (2	ChatGPT 4o ~			H
	What can I help with?			
	Ask anything			
	+ ( Search ) Peep research			
		<b>k</b>		
	ChatGPT can make mistakes. Check important info.			



# **Generative AI – Ideation**

## Brainstorming

Systematic Inventive Thinking

## Theory of Inventive Problem Solving

LiDAR DEM vs Conditioned DEM







## **Generative AI – Deep Research**





## **Generative AI – Deep Research**





# **Generative AI – Agents**

## Autonomous Software

- Perform Tasks
- Make Decisions
- Interact with the Environment
- Learn and Adapt



# **Generative AI – Agents**

Autonomous Software

- Perform Tasks
- Make Decisions
- Interact with the Environment
- Learn and Adapt

Microsoft Work Recall & Copilot Vision

OpenAI – Operator

BIM Engine AI

ArcGIS Pro AI Assistant (Beta)

Bunting Labs – Kue (QGIS Agent)

Fulcrum – Audio FastFill (Field Data Collection Agent)



## Technical writing with GPTs – designing effective prompts and sorting, templating, and drafting information

- Expediting tasks for sorting, templating, and drafting content during the pre-editing stages of writing
- Not for content creation (i.e., writing documents of original content)
  - Mode for expediting drafting tasks
- CGPT 4.0: Data Analyst / CoPilot free tiers



# UF Writing Program

# Demos

- 1. Design effective prompts for writing tasks
- 2. Sort data or qualitative info and create visuals
  - Sorting and visualizing water analytes data
- 3. Thematize/code qualitative info/data and sentiment analysis
  - Sorting and thematizing info, like short responses from a survey, or keywords from documents, etc.
- Design/draft one document for specific audiences from preexistent, original documents (e.g., how to convert a longer Research/Field Report into, say, a Memo report - engineering analysis, or and Executive Summary - financial impact analysis
  - Using delimiters in prompts for complex tasks

# **Prompt design – use directional keywords**

FOR SORTING or ANALYSIS: Specify task + parameters

Action/imperative verb + [task instruction that is *specific* yet *concise*] EX: "Identify which percentages appear in Table 1 but not in Table 2."

FOR DRAFTING TASKS: [Table; Bar Chart; Memo Report: Engineering Analysis; Executive Summary: Financial Impact Analysis]

State the visual/document first, then information related to formatting and audience.

EX: "Create a table from the following percentages, wherein column 1 includes \_\_\_\_\_"

EX: "<u>Create a Memo Report emphasizing Engineering Analysis information</u> from the following document."

FINE-TUNE THE WRITING: [Length, content used, style, tone]

EX: "<u>Reduce</u> the following memo report to <u>300 words</u>, and include <u>numerical figures</u> in Section 3 by using content from the <u>section entitled "Financial Analysis</u>" in the following document:

## Demo 1: Sorting data or information and creating visuals – tables

Scenario: You want to sort data from a source to use in one of your own documents.

## Example: 1. EPA water quality report

Table 1 is from EPA information on water quality thresholds for Potable WaterSupply for public water systems.Table 2 shows the results of water testing from a specific well.

You want to identify which analytes exceed water quality thresholds.

Table 1: Water quality thresholds set by DEP for analytes Potable Water Supplyfor Groundwater in Florida

Indicator	Threshold for Potable Water Supply (Groundwater) <sup>1</sup>
Fluoride	≤ 4 mg/L
Arsenic	≤ 10 µg/L
Cadmium	≤ 5 μg/L
Chromium	≤ 100 μg/L
Lead	≤ 15 μg/L
Nitrate+Nitrite	≤ 10 mg/L as N
Sodium	≤ 160 mg/L
Total Coliform Bacteria	≤ 4 counts <sup>2</sup> /100 mL

#### Table 2: Fairview Well analytes test results

	-
Fluoride	.076 mg/L
Arsenic	.003 μg/L
Cadmium	.000 μg/L
Chromium	≤ 21 μg/L
Lead	6.4 μg/L
Nitrate+Nitrite	≤ 12.5 mg/L as N
Sodium	10.6 mg/L
Total Coliform Bacteria	≤ 6 counts/100 mL

Demo 1: Sorting data or information and creating visuals – tables Scenario: You want to sort data from a source to use in one of your own documents.

# **Prompt: Show which analytes from Table 2 surpass the acceptable thresholds shown in Table 1:**

## Output from CoPilot:

Based on the comparison between the test results from Table 2 and the thresholds from Table 1, the following analytes surpass the acceptable thresholds:

- Nitrate+Nitrite: The test result is 12.5 mg/L as N, which exceeds the threshold of 10 mg/L as N.
- Total Coliform Bacteria: The test result is 6 counts/100 mL, which exceeds the threshold of 4 counts/100 mL.

Output from Chat GPT:

To determine which <u>analytes</u> surpass the thresholds, we compare the values in Table 2 against the thresholds in Table 1.

#### **Comparison Results:**

```
    Fluoride:

            Result: 0.076 mg/L
            Threshold: ≤ 4 mg/L
            Status: Within limit

    Arsenic:

                Result: 0.003 µg/L
                Status: Within limit
                Cadmium:

                    Result: 0.000 µg/L
                    Status: Within limit
```

ETC

Summary of Exceedances:

• Nitrate + Nitrite exceeds the threshold with a value of 12.5 mg/L (threshold: ≤ 10 mg/L).

Total Coliform Bacteria exceeds the threshold with a value of 6 counts/100 mL (threshold:  $\leq$  4 counts/100 mL).

Demo 1: Sorting data or information and creating visuals – tables Scenario: You now want to visualize this data in a table.

# Prompt: Place these results into a <u>table</u>. <u>Column one</u> contains the analyte and <u>column two</u> contains the description.



# Demo 2: Thematizing qualitative data/info

Scenario: You want to identify and categorize keywords or themes in a document, like for example, short responses in a survey.

# You can also run sentiment analysis (opinions/attitudes – negative, positive, neutral)

Example survey results on using Grammarly or Authorship tools:

#### In 1-3 sentences:

Please share what you've found most useful about Grammarly and-or Authorship, if you've liked it thus far.

Alternatively, share why these tools aren't <u>useful</u> or appealing to <u>you</u>, if you haven't used them or don't like them.

#### 42 responses

I am apprehensive to use programs that use AI, especially in a creative sense like writing. Haven't fealt the need for any of it's tools so far.

I do not use grammarly often, but from the times I have used it, it has helped me correct mistakes I could not see.

They have been able to find any mistakes in my writing, even those that I don't find or aren't found by other editing software, such as that built into Microsoft Word or Google Docs. They have also been useful for making my writing more coherent and flow better.

I haven't used <u>much</u> of the AI features, but the word replacement suggestions to allow the sentences to flow better have been wonderful. In addition, I <u>really</u> like the access to the premium features <u>that I</u> didn't have access to before. I haven't used authorship because it seems to be locked into Google Docs and I mostly use Microsoft Word. I also am a MacBook user and because there is no native Google Docs app I am less likely to use it <u>resulting</u> in less chances for me to use authorship. I do like how Grammarly isn't invasive and I can activate/deactivate it easily.

I think authorship should be on by <u>default</u>, I didn't realize I had to turn it on at first <u>so</u> I didn't. The only thing other than that is that Grammarly would often <u>be running in places that</u> I don't need to, so it is mildly annoying.

Grammarly's grammar checking is beneficial as I often don't use proper grammar. Authorship has not been practical yet, but it may be in the future.

# Demo 2: Thematizing qualitative data/info

Scenario: You want to identify and categorize keywords or themes in a document, like for example, short responses in a survey.

**Prompt:** Please identify all responses that mention "Authorship" in the following list. Then, thematize these responses. [Note – you can run sentiment analyses as well].



Demo 3: Designing particular types of documents for *specific audiences* from preexisting content Scenario: You need to reduce a longer, multi-page analysis report into a short-form (1-page) document, like a Memo Report or Executive Summary.

You'll use the same report to provide information for the following *different audiences or purposes:* 

1. General Summary (useful for a Memo Report or Executive Summary) of the report - Outside agencies (DEP or EPA), the public

2. Engineering analysis summary - Peer engineers / peer agencies

3. Financial impact summary - Financial review

4. Ecological impact - DEP / EPA regulation and compliance agencies

Sample document: SJRWMD's <u>"UPPER OCKLAWAHA RIVER BASIN FLOOD CONTROL SCREENING</u> <u>ANALYSIS"</u>



Prompt: Provide a 300word Engineering Analysis of the attached document that prioritizes *engineering design features* of each option:

#### Engineering Analysis of Flood Control Design Options

The **Upper Ocklawaha River Basin Flood Control Screening Analysis** evaluates multiple engineering design alternatives to enhance flood protection, particularly in response to extreme events like Hurricane Irma. Each option presents unique structural, hydrological, and environmental considerations.

1. Flood Storage in Lake Apopka and Lake Apopka North Shore (LANS)

This option involves raising Lake Apopka's maximum desirable water elevation from 66.4 ft to 67.0 ft NAVD88, potentially providing 32,500 acre-feet of additional flood storage. The design benefits include:

- Operational Flexibility: Increased storage allows gradual downstream releases, preventing sudden discharge surges.
- Water Quality Improvements: Higher average water levels enhance treatment at the Lake County Nutrient Reduction Facility (NuRE).
- Cost-Effectiveness: This option requires minimal infrastructure changes, making it the lowest-cost solution.

However, utilizing LANS as overflow storage has **limited reusability**—once flooded, it takes **months** to drain, restricting its effectiveness in back-to-back storm events. Additionally, it may require **alum treatment costs** for nutrient removal.

2. Duncan Drive Path (Lake Dora to Lake Harris)

This **2.4-mile canal project** aims to bypass the **flow restriction at Dora Canal** but is deemed **unfeasible** due to:

- A 45-ft elevation difference, requiring large pump stations to move 1,000 CFS.
- Infrastructure Challenges: A canal would need to cross a CSX railroad, State Road 19, and multiple properties, significantly increasing costs and legal hurdles.
- High Land Acquisition and Mitigation Costs: The alignment would affect commercial and agricultural land, making it impractical.

3. Double Run Swamp Path (Lake Apopka to Little Lake Harris)

This **3.5-mile canal option** provides **direct discharge from Lake Apopka to Little Lake Harris** with a **10-ft elevation drop**, eliminating the need for pumps. Key engineering aspects include:

- Smoother Hydrological Flow: The existing Marsh Flow-Way can be integrated, reducing new infrastructure needs.
- Minimal Structural Barriers: Unlike the Duncan Drive Path, this alignment avoids major railways and highways.

However, significant wetland impacts (60 acres) require mitigation, and a nutrient treatment facility is needed to meet downstream Total Maximum Daily Load (TMDL) limits. The estimated cost is \$70 million, covering design, land acquisition, and construction.

#### Conclusion

From an engineering feasibility perspective, the Double Run Swamp Path is the most viable long-term solution due to its gravity-driven flow and integration with existing hydrology. However, raising Lake Apopka's water level remains the most cost-effective short-term measure, offering flexibility, flood mitigation, and water quality benefits. The Duncan Drive Path should be dismissed due to extreme construction and permitting constraints.

## CGPT Data Analyst output

Demo 4: Converting summaries into Memo Reports Scenario: You want to convert these general summaries into an actual interoffice document form, like a Memo Report.

NOTE: GPTs are NOT accurate with generic (document) conventions, so prompt accordingly:

**Prompt:** Convert the following summary into a 300-word memo report with a recommendation for the most viable option.

XXXXX

For this memo report, use the following headings:

Objective Analysis Recommendation Demo 4: Converting summaries into Memo Reports Scenario: You want to convert these general summaries into an actual interoffice document form, like a Memo Report.

NOTE: GPTs are NOT accurate with generic (document) conventions, so prompt accordingly:



## Demo 4: Converting summaries into Memo Reports

#### Objective

The objective of this report is to analyze and recommend the most viable flood control design option for the Upper Ocklawaha River Basin, focusing on enhancing flood protection in response to extreme weather events like Hurricane Irma. The options evaluated in this analysis include Flood Storage in Lake Apopka and Lake Apopka North Shore (LANS), the Duncan Drive Path from Lake Dora to Lake Harris, and the Double Run Swamp Path from Lake Apopka to Little Lake Harris.

#### Analysis

#### 1. Flood Storage in Lake Apopka and Lake Apopka North Shore (LANS):

This option involves increasing Lake Apopka's maximum water elevation from 66.4 ft to 67.0 ft NAVD88, offering 32,500 acre-feet of additional flood storage. This solution provides operational flexibility by allowing gradual downstream releases, which can help prevent sudden discharge surges. Additionally, it offers water quality improvements and is the most cost-effective option, requiring minimal infrastructure changes. However, its reusability is limited since the storage area takes months to drain once flooded, and alum treatment may be needed for nutrient removal.

#### 2. Duncan Drive Path (Lake Dora to Lake Harris):

This 2.4-mile canal project aims to bypass flow restriction at Dora Canal. The significant elevation difference (45-ft) necessitates large pump stations for 1,000 CFS, leading to major infrastructure challenges. The canal would have to cross critical points like a CSX railroad and multiple properties, escalating costs and legal issues. High land acquisition and mitigation costs make this option impractical.

#### 3. Double Run Swamp Path (Lake Apopka to Little Lake Harris):

This 3.5-mile canal option allows direct discharge from Lake Apopka to Little Lake Harris with a 10-ft elevation drop, eliminating the need for pumps. It integrates smoothly with existing hydrology, minimizing the need for new infrastructure. However, it impacts 60 acres of wetland, requiring significant mitigation and a nutrient treatment facility to meet downstream TMDL limits. The estimated cost is \$70 million.

#### Recommendation

From an engineering and feasibility perspective, the **Double Run Swamp Path is the most viable long-term solution due to its gravity-driven flow and integration with existing hydrological systems.** However, for a cost-effective and immediate measure, raising Lake Apopka's water level remains the best option, offering operational flexibility, flood mitigation, and water quality benefits. The Duncan Drive Path should be dismissed due to severe construction and permitting constraints. This is *still* just a template. For example:

- A memo heading must be added.
- A rec statement should be added to the Objective section.
- Syntax, technical detail, and context for each option needs to be revised or refined.
- This report does not mention that this rec is geared toward the likelihood of 1-in-10 year flood event (10% chance/yr.) – this is important to include to justify the rec.

Demo 5: Using delimiters in prompts for specific commands

SJRWMD's <u>"UPPER OCKLAWAHA RIVER</u> BASIN FLOOD CONTROL SCREENING ANALYSIS"

• Land Acquisition =  $42 \pm acres (150 \text{ linear feet R/W})$ 

 Assumes existing Marsh Flow-Way is of adequate cross section to convey the desired flow.

 No additional infrastructure improvements to the Marsh Flow-Way or the receiving cells are included in the described cost.

· Treatment facility required to meet downstream TMDLs.

\*\*\*\*

	Cost Summary
Modeling	\$ 200,000
Design	\$ 4,360,000
Public Outreach	\$ 10,000
Construction	\$ 43,600,000
Wetland Impacts	\$ 8,400,000
Land Acquisition	\$ 230,000
30% Contingency	\$ 13,080,000
TOTAL COST	\$ 69,880,000
(Would be additional costs for	ongoing treatment - \$51/acre-ft or 0.00117 / ft3

The above cost is based on broad assumptions regarding topography and other physical conditions in the area. Using the assumed 1,000 cfs plus the capacity present in the existing outfall from Lake Apopka represents a level of service that could handle a 200-year event or greater. Costs would be less for a lower level of service due to a smaller channel cross-section, smaller/fewer pipes and a smaller treatment facility.

Delimiters are special characters used to clearly separate sections of the text within a prompt. This commands the GPT to focus on specific parts of a document and do a specific task - e.g., summarize X section, analyze Y aspect of Z section, include X table from the document, etc.

Scenario: You want the GPT to focus/use/analyze a *specific area or section* of a longer document to build your own document.

We'll use the three most common delimiters for writing all at one time to demo:

## XML tags: < content enclosed >

- triple quotations """
- headings

#### **Prompt:**

You will be provided with a memo report delimited with <u>XML tags</u>.

You will then be provided a document with financial information delimited with triple quotations """".

Add all the delimited financial information as a section with the <u>heading</u> entitled "Financial Information" below the memo's recommendation section and place dollar amounts in a table.

<memo>

<memo>

Demo 5: Using delimiters in prompts for specific commands

We'll use the three most common delimiters for writing all at one time to demo:

XML tags: < content enclosed >

triple quotations """

headings

**Prompt:** 

You will be provided with a memo report delimited with <u>XML tags</u>.

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Add all the delimited financial information as a section with the <u>heading</u> entitled "Financial Information" below the memo's recommendation section and place dollar amounts in a table.

<memo>

<memo>



## CGPT Data Analyst output

#### Upper Ocklawaha River Basin Flood Control Screening Analysis

by Amy P. Wright, PE St. Johns River Water Management District Palatka, Florida October 4, 2019

#### UPPER OCKLAWAHA RIVER BASIN FLOOD CONTROL SCREENING ANALYSIS

#### Objective

The objective of this report is to analyze and recommend the most viable flood control design option for the Upper Ocklawaha River Basin, focusing on enhancing flood protection in response to extreme weather events like Hurricane Irma. The options evaluated in this analysis include Flood Storage in Lake Apopka and Lake Apopka North Shore (LANS), the Duncan Drive Path from Lake Dora to Lake Harris, and the Double Run Swamp Path from Lake Apopka to Little Lake Harris.

#### Analysis

- 1.Flood Storage in Lake Apopka and Lake Apopka North Shore (LANS): This option involves increasing Lake Apopka's maximum water elevation from 66.4 ft to 67.0 ft NAVD88, offering 32,500 acre-feet of additional flood storage. This solution provides operational flexibility by allowing gradual downstream releases, which can help prevent sudden discharge surges. Additionally, it offers water quality improvements and is the most cost-effective option, requiring minimal infrastructure changes. However, its reusability is limited since the storage area takes months to drain once flooded, and alum treatment may be needed for nutrient removal.
- 2.Duncan Drive Path (Lake Dora to Lake Harris): This 2.4-mile canal project aims to bypass flow restriction at Dora Canal. The significant elevation difference (45-ft) necessitates large pump stations for 1,000 CFS, leading to major infrastructure challenges. The canal would have to cross critical points like a CSX railroad and multiple properties, escalating costs and legal issues. High land acquisition and mitigation costs make this option impractical.
- 3.Double Run Swamp Path (Lake Apopka to Little Lake Harris): This 3.5-mile canal option allows direct discharge from Lake Apopka to Little Lake Harris with a 10-ft elevation drop, eliminating the need for pumps. It integrates smoothly with existing hydrology, minimizing the need for new infrastructure. However, it impacts 60 acres of wetland, requiring significant mitigation and a nutrient treatment facility to meet downstream TMDL limits. The estimated cost is \$70 million.

#### Recommendation

From an engineering and feasibility perspective, the Double Run Swamp Path is the most viable long-term solution due to its gravity-driven flow and integration with existing hydrological systems. However, for a cost-effective and immediate measure, raising Lake Apopka's water level remains the best option, offering operational flexibility, flood mitigation, and water quality benefits. The Duncan Drive Path should be dismissed due to severe construction and permitting constraints

#### Financial Information

Item	Cost
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30% Contingency	\$13,080,000
TOTAL COST	\$69,880,000
Ongoing Treatment	\$51/acre-ft or 0.00117 / ft <sup>3</sup>

The above cost is based on broad assumptions regarding topography and other physical conditions in the area. Using the assumed 1,000 cfs plus the capacity present in the existing outfall from Lake Apopka represents a level of service that could handle a 200-year event or greater. Costs would be less for a lower level of service due to a smaller channel cross-section, smaller/fewer pipes and a smaller treatment facility.

- Attempts to include memo header – still needs:
  - To / From / Date / RE: heading
- Needs rec in Objective section
- Needs context of 1in-10 year flood event which contextualizes the recommendations properly.
- This is a *template* to build out.

Section 2

# Advanced Prompting

**Revisiting the Revising Process with AI** 

beautiful.ai

## Objectives

- Execute a Chain of Destiny Prompt
- <sup>2</sup> Tune a Prompt with Examples
- <sup>3</sup> Try Thinking Models



Scenario

# You have drafted executive summary but want to check if something is missing or if it could be better

#### Prime

I am about to paste my summary of the source. Tell me when you have read it. Do not remark on it. Instead, tell me when you are ready for a prompt. Here is my summary: " [summary]."

#### Prompt

You will generate an increasingly concise, entity-rich summary of the article based on my summary. Repeat the following 2 steps 5 times. Step 1: Identify 1-3 informative entries from the previous summary that are missing. Step 2: Write a new, richer summary which covers every entity and detail from the previous summary plus the missing entities. A missing entity is: relevant (to the main article); specific (descriptive yet concise); novel (not in the previous summary); faithful (present in the article); and, located anywhere within the article. Guidelines: You must not use bullet points; Use the author name; Improve flow and create space for new entities with fusion, compression, and removal of uninformative phrases like "this article discusses"; The summaries should become highly dense and concise yet self-contained (i.e., easily understood without the article); Missing entities can appear anywhere in the new summary.

## Demo 1

Chain of Destiny Prompt

Resource

Google NotebookLM





#### **Recognizing SF**

Sources



Select all sources

PDF 10.1515\_lass-2022-2006.pdf



 $\checkmark$ 

 $\checkmark$ 

Step 1: Identify 1-3 missing informative entities.

- Property phobic: Miller notes that science fiction, like autism and obscenity, is a "property phobic" category, meaning it's difficult to define by shared properties yet is still widely recognized 8.
- Neuroscience: Miller suggests that future work in neuroscience could further refine our understanding of the estranging aspects of science fiction beyond singular understandings of cognition 15 .....
- Batesonian difference: Miller invokes Bateson's idea of "a difference which makes a difference" in relation to the essentializing process of recognizing nebulous categories like science fiction 8 .....

Step 2: Write a new, richer summary. **Zea Miller** argues against defining science fiction by fixed attributes, asserting that its recognition, supported by **cultural production**, arises from socio-cognitive processes centered on a dynamic "mode of creation" **1** .... This recognition, **Miller** contends, is facilitated by **prototypes** developed through experience with the genre, alongside underlying theories formed from clustered **exemplars**, even though science fiction is a "**property phobic**" category **8** ..... This process aligns with a **dual theory** of concept recognition, incorporating both rapid identification and reasoned confirmation **4** .... Instead of focusing on static definitions, **Miller** emphasizes **means over ends**, where the creative

Start typing...

1 source

>

C Refresh

According to Miller, how does recognition of SF function?

Studio	
Audio Overview	(
Click to load the conversation	on. Load
Notes	
Notes + Add note	
Notes + Add note	Briefing doc

Share

Settings

- E Defining Science Fiction: Prototypes, Processes,... FAQ Why is it so difficult to define science fiction (SF)? Defining SF is challenging because it lacks a...
- Science Fiction Recognition: A Cognitive Approach Science Fiction Recognition Study Guide Quiz According to the article, what is the primary issue...
- Recognizing Science Fiction: A Cognitive... Okay, here is a detailed briefing document reviewing the main themes and important ideas from the...

beautiful.ai

Scenario

You must compose a complicated email, have multiple versions prepared, and want AI to reconcile them

#### Instructions

**Role:** Act as a professional writer who specializes in simplification and linear argumentation. **Task:** Please compose an effective email that maintains a professional tone, an informative stance, and a persuasive purpose. **Goal**: By the end of the email, the target audience should be able to consider the content favorably, reasonably, and toward optimal ends. **Steps:** First, imagine the task and goal could be fulfilled. Second, consider how the content could be presented as a structural syllogism using a problem-solution framework. Third, compose the email. **Constraints:** It is important that the email be both effective and adhere to the professional email genre. **Format:** Please relay your draft as paragraphs.

Input

| Version xN | Email Draft | xN

## Demo 2

Tune a Model to Generate Response

Resource

Google Al Studio

Source

PromptHub Blog



#### Google Al Studio Email / (A) Save 25 Insert: 🖬 Image Run settings ⊙⇒ Get API key framework. Third, compose the email. Constraints: It is important that the email be both effective and adhere to the professional email genre. Format: Please relay your draft as paragraphs. <> Get code Et Create Prompt 🕅 Model Actions -2 / 500 examples Stream Realtime Gemini 2.0 Flash • Starter Apps INPUT input: OUTPUT output: ∃≟ Tune a Model Affordable Food Dear Leadership, ⑦<sup>↑</sup> Token count 壹 Library 239 / 1,048,576 Food should be affordable for students but it is often too Email Email expensive and students sometimes have to skip meals. ∆= Temperature Therefore, cheap options should be made available. Ħ Conclusion Sincerely, **Prompt Gallery** Ц ✓ Test your prompt (i) ^ Tools API documentation INPUT input: OUTPUT output: Structured output Developer forum Affordable Food at Affordable Restaurants Dear Leadership, Edit Changelog NEW Students need access to affordable and nutritious food to Code execution support their academic success and overall well-being. Currently, the availability of affordable restaurant options 0 catering to student budgets on and near campus is limited. This situation can lead to financial strain, unhealthy eating habits, and decreased student focus. **Function calling** Gemini makes mistakes, so double-Edit To address this need, we propose exploring partnerships with check it. local restaurants or establishing a subsidized dining program. By increasing the availability of affordable and nutritious food Groundi MADE WITH Settings Search beautiful.ai

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Dun well

Scenario

You want to thoughtfully or methodically approach a revision problem and follow the reasoning behind the recommendation

#### Prompt

First, consider how this LLM prompt might be improved; then, second, compose a new version of it according to your findings: "Role: Act as a professional writer who specializes in simplification and linear argumentation. Task: Please compose an effective email that maintains a professional tone, an informative stance, and a persuasive purpose. Goal: By the end of the email, the target audience should be able to consider the content favorably, reasonably, and toward optimal ends. Steps: First, imagine the task and goal could be fulfilled. Second, consider how the content could be presented as a structural syllogism using a problemsolution framework. Third, compose the email. Constraints: It is important that the email be both effective and adhere to the professional email genre. Format: Please relay your draft as paragraphs."

Demo 3

Use a Thinking Model

Resource

## Google Gemini

Select: Model: 2.0 Flash Thinking Experimental



## 6

#### Second, Revised Version of the LLM Prompt:

Here is a revised version of the prompt, incorporating the improvements identified above:

\*\*Improved Prompt Version:\*\*

\*\*Role:\*\* You are a professional business communication expert specializing in cran \*\*Task:\*\* Compose a highly effective email designed to achieve a specific persuasiv \*\*Goal:\*\* By the conclusion of the email, the recipient should not only understand

\*\*Steps for Content Structuring:\*\*

- 1. \*\*Problem-Solution Framework:\*\* Organize the email's content using a clear pro!
- 2. \*\*Logical Flow:\*\* Ensure a clear and logical flow of information throughout the
- 3. \*\*Professional Email Genre Adherence:\*\* Strictly adhere to the conventions of

\*\*Constraints:\*\* The email must be both persuasive and rigorously conform to the st

\*\*Format:\*\* Please present your drafted email as a series of well-formed paragraph:

#### Explanation of Revisions:

- Enhanced Role: Made the role more specific ("business communication expert," "crafting clear, concise, and persuasive emails") to better guide the LLM's persona.
- Defined "Effective Email": Explicitly defined what constitutes an "effective email" in this

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# Indian River Lagoon Smart Watershed Network Management (SWNM)



Brightstorm is a program of



## We can't tear down the cities we've built

March and a star

but we can reprogram them

to act more like nature.



#### Mission

Test leading edge technologies to help people and organizations identify, design and implement novel solutions in water management



Vision

Intelligent stormwater infrastructure networked and coordinated to create more adaptive, resilient environments across the world

Open-source tools

Advanced computing

Democratizing knowledge Scientifically robust

Modular, flexible

User centered

# Smart Watershed Network Management Pilot

V Pilot study to integrate new technologies into water management strategies

- N Broad partnerships to make open source and replicable
- Multi-year upfront modeling and design phase followed by pilot implementation and real-world testing







Historically ponds release without an understanding of the impact of rate/timing on the watershed and other ponds nearby.





Advances in technology have allowed us to upgrade this technology – to start to think about "air traffic control" for water

# Why Florida, Why the IRL?

Development, climate change, and poor performing infrastructure are threatening North America's most productive and biodiverse estuary, the Indian River Lagoon.





Lots of ponds (>10,000), lots of rain! Strategically located for maximum impact.



Regulators, policymakers, and the public willing to embrace technology solutions.



Implementation partners willing to build, monitor, and maintain projects.

## Key components #1 - Intelligent infrastructure advancements



Continuous Monitoring and Adaptive Control (CMAC)

10 years of testing & implementation along with advancements in reliability and performance.

2 billion data points collected, 200 million control decisions made, 7 billion gallons of wet weather flows captured

## Key components #2 - Computational advancements and hybrid analytics

The big technology companies have been busy working with government and nonprofits to better understand natural earth systems. AI-powered TERRAHydro could help hydrologists better understand the water cycle

N'A SA

News

About

Source: <a href="https://esto.nasa.gov/ai-powered-terrahydro-could-help-hydrologists-better-understand-the-water-cycle/">https://esto.nasa.gov/ai-powered-terrahydro-could-help-hydrologists-better-understand-the-water-cycle/</a>

**Project Portfolio** 

Investment Areas V



We can now create digital twin models that can quickly and accurately predict a watershed response with CMAC-enabled infrastructure.

Source: Nvidia's Earth-2 Al tool @ <u>https://www.nvidia.com/en-us/</u> high-performance-computing/earth-2/

# Combining these advancements to develop...

## a coordinated watershed that learns and adapts over time





## **Progress to Date -Watershed Prioritization**

An open-source tool that processes large-scale data to identify clusters of ponds, develop automated flow networks, and auto-generate H&H models to assess CMAC control benefits.

## Why this is important?

Users/Public Agencies will be able to prioritize microwatersheds quickly, easily, and dynamically, without technical expertise or specialized software, democratizing access to decision-support and planning tools.



## Progress to Date – Ultra Fast Modeling



We have developed a highly efficient simulation approach that runs 1,000x faster than traditional models. Simulates the impact of retrofitting control devices on stormwater infrastructure, enabling thousands of scenarios to be tested in the time previously needed for **one**.



## **AI/ML Methodologies - Representing the watershed**

## **Graph Representation of Drainage Systems**

Hydrological Networks are natural graphs, and can be simplified/ modelled to capture relationships.

## Representation

- **'Nodes'** capture points of interest (e.g. pond outflows, junctions, change in hydraulics) and their attributes (e.g. inflow, storage)
- **'Edges'** Captures the relationships and attributes between the nodes (e.g. length, capacity and flow rates)

Formats – Both of which represent models in a graphical format

#### Physics-based Surrogate Model

- Still uses physics based calculations like traditional models
- Used to rapidly simulate scenarios to achieve control strategies

## Al/ML-based Surrogate Model

- Graph Neural Networks (GNNs) are commonly used for this type of problem
- Learns the relationship and physics between points through model training



## The Next Frontier... Deep Reinforcement Learning

Training Agent(s) to make control decisions through interacting with the environment (our graphical model) to maximize cumulative rewards (e.g. water retention).

- **Explore & Learn** The AI agent interacts with its environment, trying different actions to understand what works best.
- **Rewards Guide Behavior** The agent receives rewards (positive or negative) based on its actions, encouraging good decisions and discouraging bad ones.
- **Trial & Error Process** By repeatedly experimenting and learning from past rewards, the agent improves its strategy over time.
- Achieving the Goal Over many trials, the agent refines its actions to maximize rewards, leading to the best possible outcome.

Data/Features pass to the Node Agents acts on the information GNN passes this information on to its neighbors Node monitors for new changes