



Make Sense of AI and What it will Mean for Your Lab

Revolutionizing Workflows with AI

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clinisys



01 August 2024

Agenda

Foundation

What is AI?



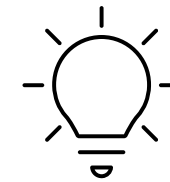
Current State

Where is Clinisys on this Journey?



Future Opportunities

AI/ML use cases
Clinisys is exploring



AI Evolution: fueled by storage, compute advancements & \$\$

“Artificial Intelligence” – 1956

‘AI’ term coined at Dartmouth workshop

Rule-Based Systems – 1960s & 1970s

Example: ELIZA Chatbots mimics human communication

Expert Systems – 1980s

Example: Carnegie Mellon’s R1 configuration tool used by Digital Equipment Corp

Machine Learning – 1990s

Example: IBM’s Deep Blue beats world Chess Champion, Garry Kasparov

Deep Learning – 2000s & 2010s

Examples: Natural Language Processing – IBM Watson wins Jeopardy!

Large Language Models (LLMs) and Gen AI – 2020s

Examples: Chat GPT, DALL-E



What is AI

This is a Good Question to ask AI !

Open your Web Browser (MS Edge) and ask Copilot

“What is AI”

Set some parameters to the “PROMPT” to guide Copilot to provide an Answer (Response) in a desired form

1. Compose
2. Informational
3. Summary
4. Short

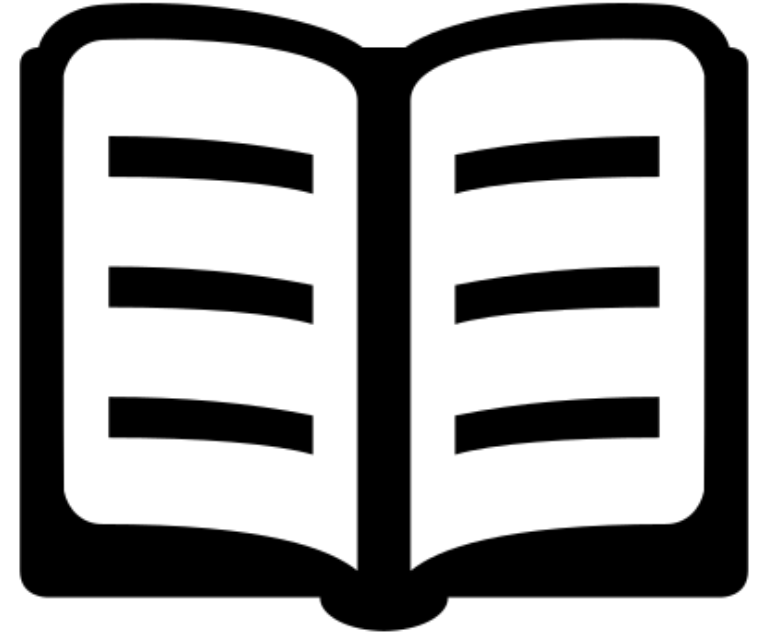
Give it a TRY !



LLMs and GenAI Terminology

- **ChatGPT** is arguably the most popular generative AI system out there at the moment. It takes OpenAI's foundation model, GPT, and tunes it for use in a chat interface
- **Prompt** is the text a user provides to a generative AI to begin its output
- **Prompt engineering** is the practice of experimenting with different prompts to get better outputs
- **Fine tuning** is the act of further training a foundation AI model in order to make it more suited to a specific task
- **Hallucination** is the tendency for LLMs to produce coherent but factually incorrect text
- **Bias** is the tendency for AI to replicate the prejudices and disparities inherent in the data it was trained on

Source: <https://faculty.ai/blog/your-essential-guide-to-genai-terminology-the-top-words-to-know/>



LLM

Large Language Models

- Neural Networks
- Trained on Massive amounts of Data
- Used for Understanding and Generating Human-like text



GenAI

Generative AI

- Trained on LLMs
- Learns from examples
- Generates content
(text, images, music, etc.)

SS

You

write me a song about Artificial Intelligence



ChatGPT

Sure! Here's a song about the wonders and complexities of artificial intelligence, styled as a modern pop piece:

Verse 1

In a world of zeros, floating through the binary sea,
Silent whispers in the circuit, telling secrets to me.
Dreaming in the data, learning through the night,
Painting thoughts from shadows, turning darkness into light.

Chorus


Oh, AI, you're the mind within the machine,
From the echoes of our voices, you're the unseen dream.
Crafting worlds from words, a dance of code and light,
AI, oh AI, you bring the stars to the night.

Verse 2

With each query you're evolving, underneath the silicon skies,
Mirroring the world, with those electric eyes.
From the rhythms of a heartbeat to the lan(↓)e of the soul,
You find the patterns hidden deep, making broken visions whole.

SS **You**

show me sheet music for this song so I can play it on the piano

 **ChatGPT**

Let's create a simple melody and chord progression for the chorus of the song about artificial intelligence. This will be suitable for playing on the piano.

Chorus Sheet Music

Key: C Major

Tempo: 120 BPM



Lyrics	Chords
(C) Oh, AI,	C
you're the (Am) mind	Am
within the (F) machine,	F
From the (G) echoes	G
of our (C) voices,	C
you're the (Am) unseen	Am
dream. (F)	F
Crafting (G) worlds	G
from (C) words,	C
a dance of (Am) code	Am
and light, (F)	F
AI, oh (G) AI,	G
you bring the (C) stars	C
to the (G) night.	G

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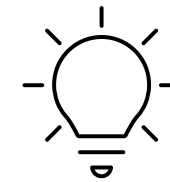
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on this Journey?



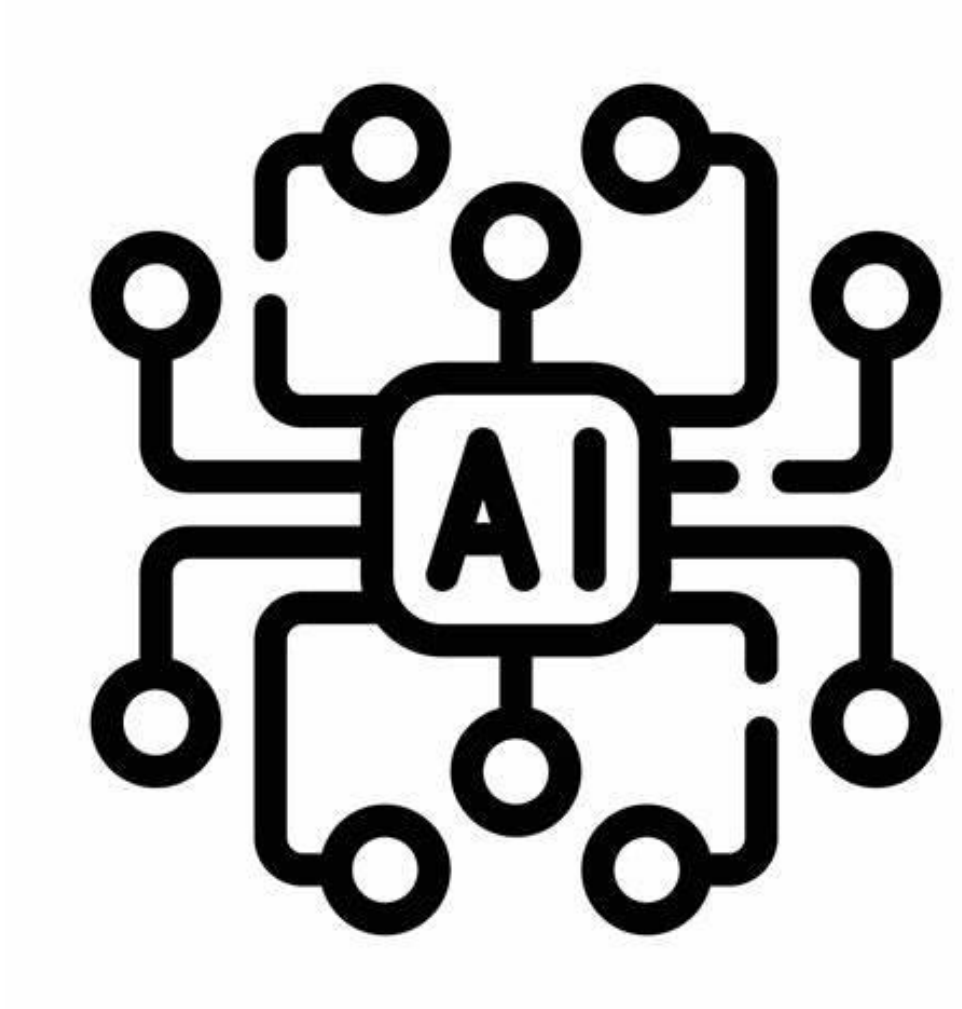
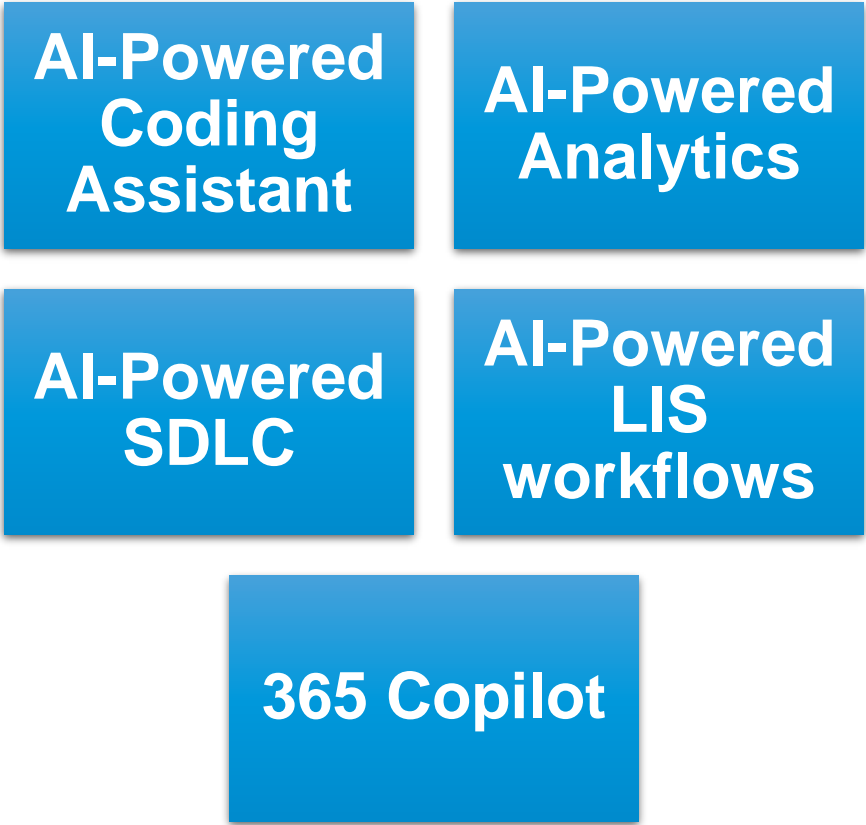
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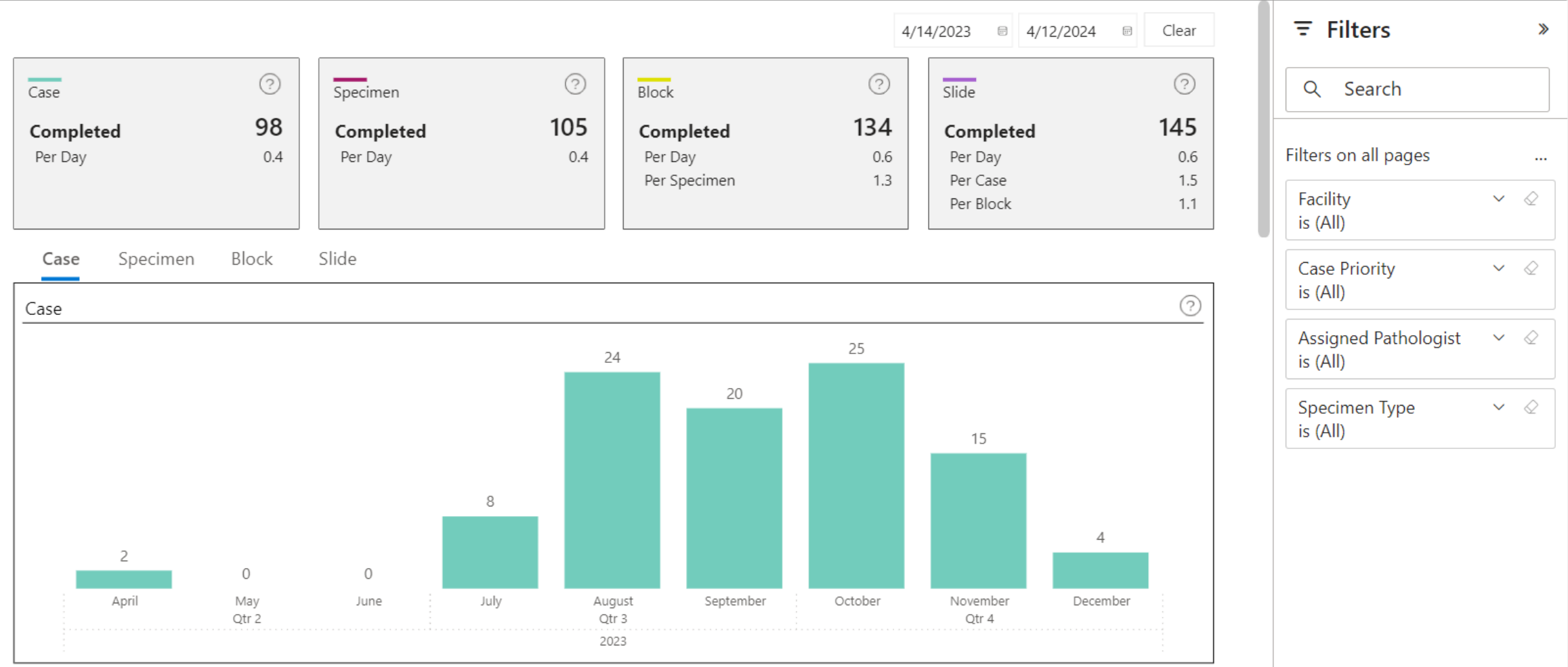
Clinisys GenAI Usage

Increasing throughput with GenAI



Clinisys Analytics & Insights

Pre-configured Dashboards



Infusing AI into Clinisys Analytics & Insights

via Natural Language Query

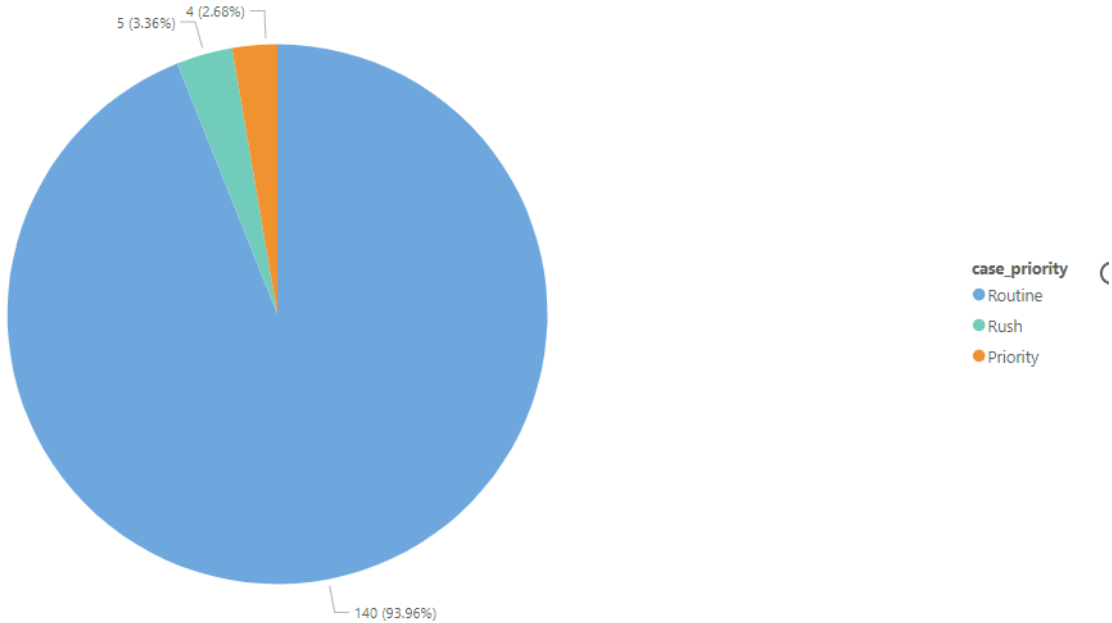
Ask a question about your data

Try one of these to get started

- top pathologists by total cases
- show me total cases for the last year
- show me total cases for the last month
- show me total errors for the last year
- top case priorities by errors
- top case priorities by errors nonzero

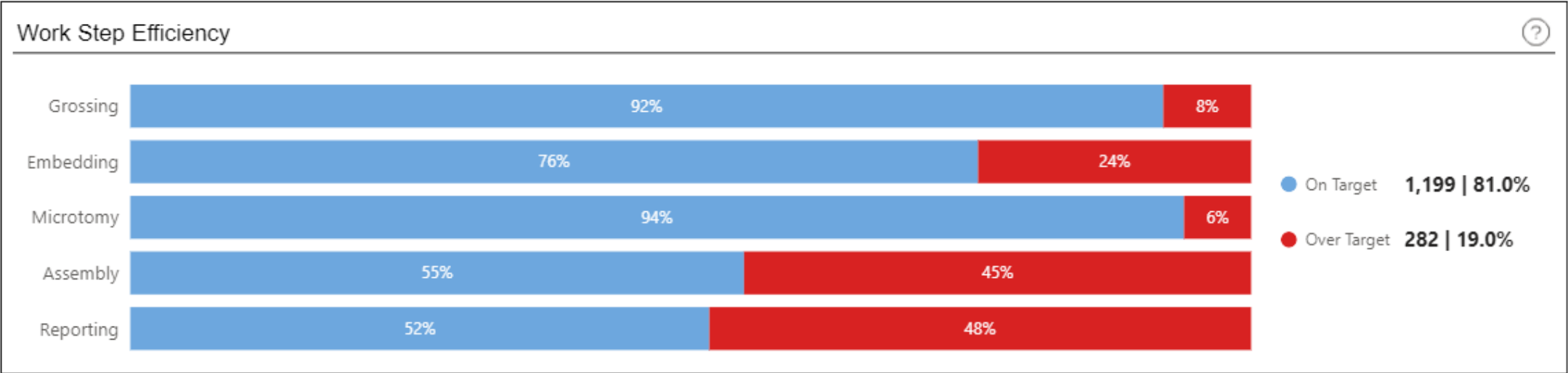
top case priorities by errors as a pie chart

Showing results for *Top 10 case priority of vw cases dims by errors of vw quality facts as pie chart*



Infusing AI into Clinisys Analytics & Insights

via Smart Narrative



Total Tasks was higher for On Target (1199) than Over Target (282).

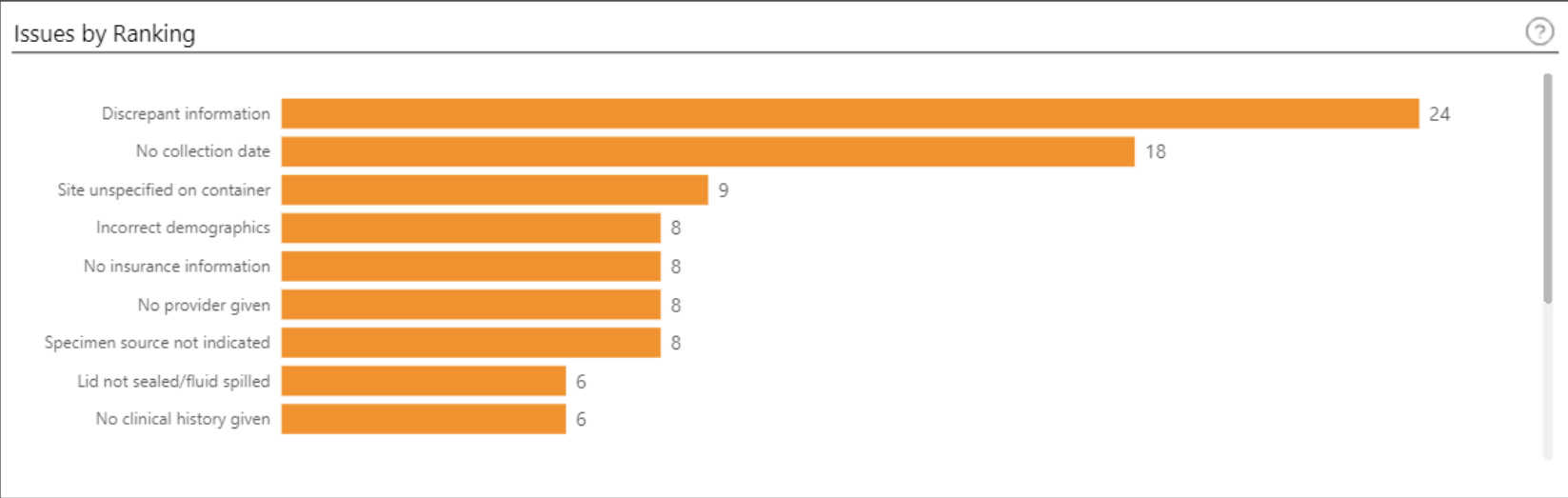
Microtomy in Status On Target made up 25.46% of Tasks.

Average Tasks was higher for On Target (239.80) than Over Target (56.40).

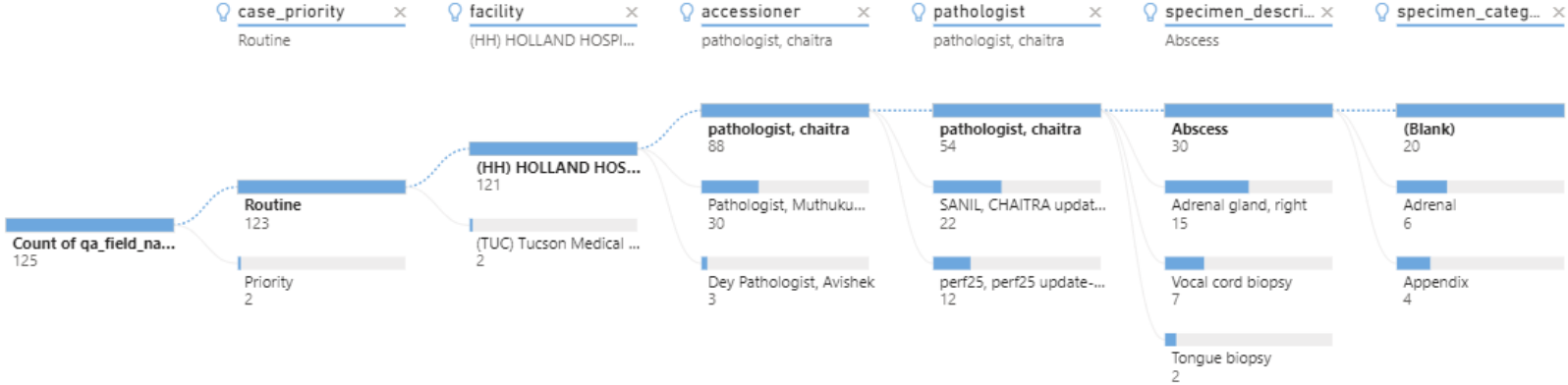
Tasks for On Target and Over Target diverged the most when the Work Step was Microtomy, when On Target were 353 higher than Over Target.

Infusing AI into Clinisys Analytics & Insights

via Decomposition Tree



Group by: None **Issue** Specimen Type Pathologist Reported By



Where are YOU at on this Journey?

Polling Question

AI is not currently on our radar

**We're thinking about it,
but haven't determined how/where to start**

We are working on our first project

**We are well on our way –
using AI in many different areas**

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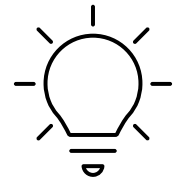
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Laboratory Challenges

- **Limited Resources:** Staff, budget, equipment, etc.
- **Manual Processes:** Repetitive tasks consume valuable time, leading to reduced efficiency and throughput
- **Data Silos:** Information exists in disparate locations hindering insight and reporting efficiency
- **Regulatory Compliance:** Multiple SOPs, Quality Control
- **Technological advances:** innovation, compatibility, etc.



Slowed progress, potential errors, frustrated staff

AI/ML Laboratory Use Cases

Potential opportunities to apply AI/ML technologies to lab workflows, reporting and analytics

- LIMS Workflow
 - Task Automation / Workflow Optimization
 - Pattern Recognition / Data Analysis
 - Knowledge Management / Research
 - Content Generation / Transcription / Note Taking
- Data Analysis
 - Data Harmonization
 - Operational Analytics
 - Predictive Analytics

AI/ML for Task Automation / Workflow Optimization



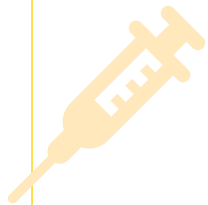
Data entry / OCR

- Extract text and images with greater accuracy across variable input forms with less configuration



Sample preparation

- Robotics
- Sample sorting, routing, and tracking



Collection & container selection

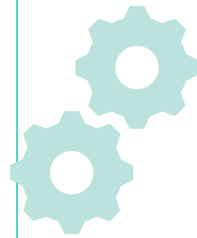
- Systematize collection routes, methods and containers used to achieve maximum efficiency and preservation of sample integrity



Critical results communication

- Automate communication and confirmation while retaining a human like delivery style

AI/ML for Pattern Recognition / Data Analysis



Rules generation

- Move from manually creating rules to detection of patterns automatically with AI



Interface mapping

- Compare sample messages and specifications to generate interface software code

AI/ML for Knowledge Management / Research



Tagging & categorization

- Automate metadata identification and selection to enable easier data retrieval and more robust analytics



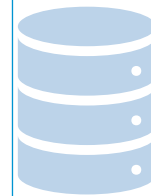
Decision support

- Aggregate latest relevant knowledge to assist in analysis / diagnosis tasks



Publication searches

- Deliver search results based on task context and relevant system data



Data queries

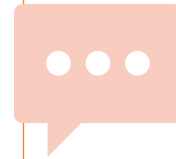
- Generate aggregated data sets across sources based on normalized inputs

AI/ML for Content Generation / Transcription



Sample observations

- Record sample descriptions, quality issues, etc.



Internal communication

- Capture comments to share with staff processing the samples



Results reporting

- Construct standardized narratives from discrete values or vice versa



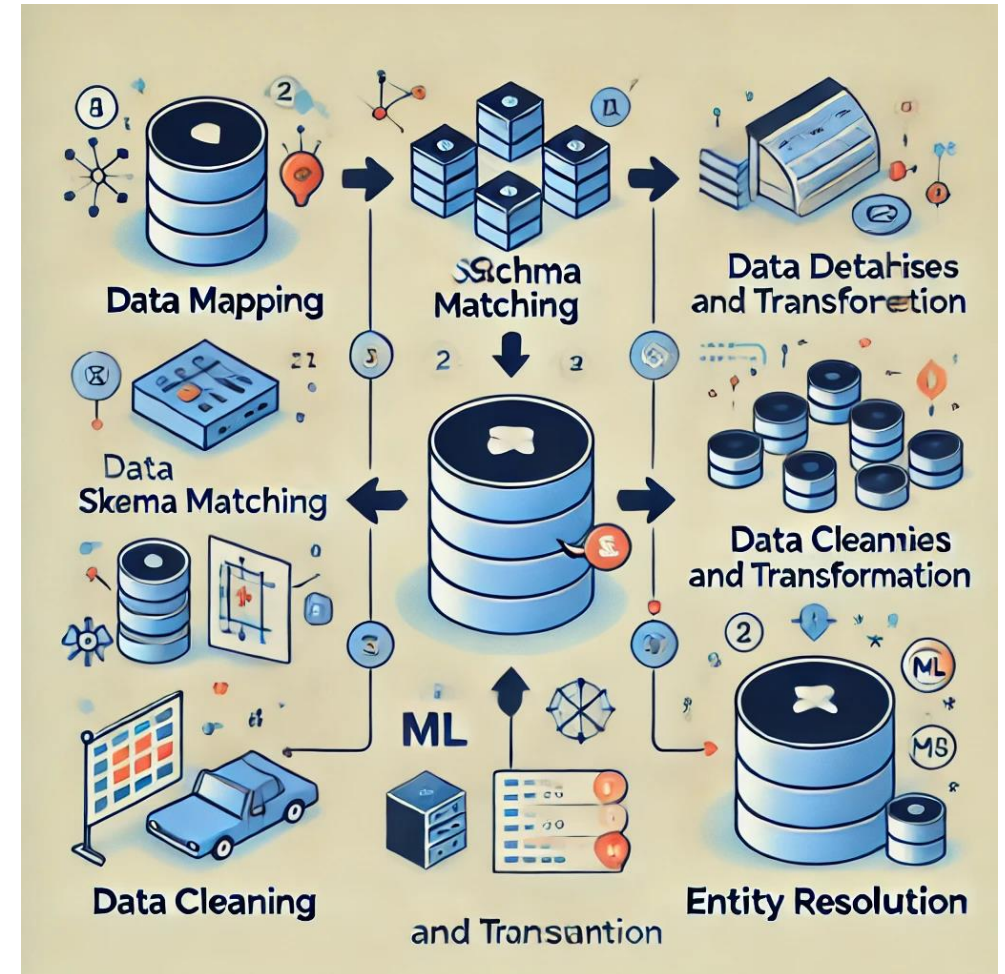
Consult reporting

- Generate detailed requests for second opinions / result verification

AI/ML for Data Harmonization

Laying the foundation for data analysis

- Data Integration
 - Using ML to identify and map similar data from different sources
- Data Cleansing
 - Detect outliers, resolve missing values, standardizing formatting
- Data Unification
 - Resolving duplicative entries with minor differences, merge duplicates

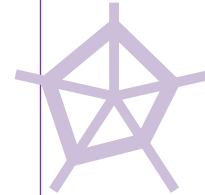


AI/ML for Operational Analytics



Fact checking

- Detect inconsistencies in data and validate the accuracy of analytics results



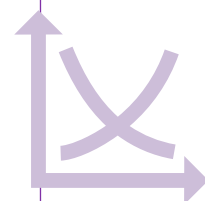
Data visualization

- Identify and create the most informative visual representation of data to more easily identify patterns and insights



Asking questions / queries

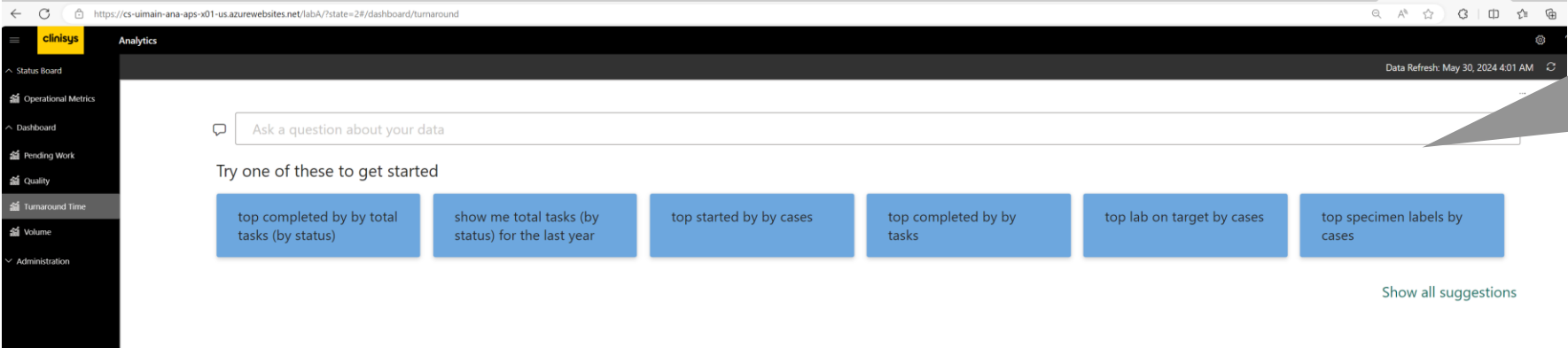
- Move from SQL queries to simpler natural human language questions



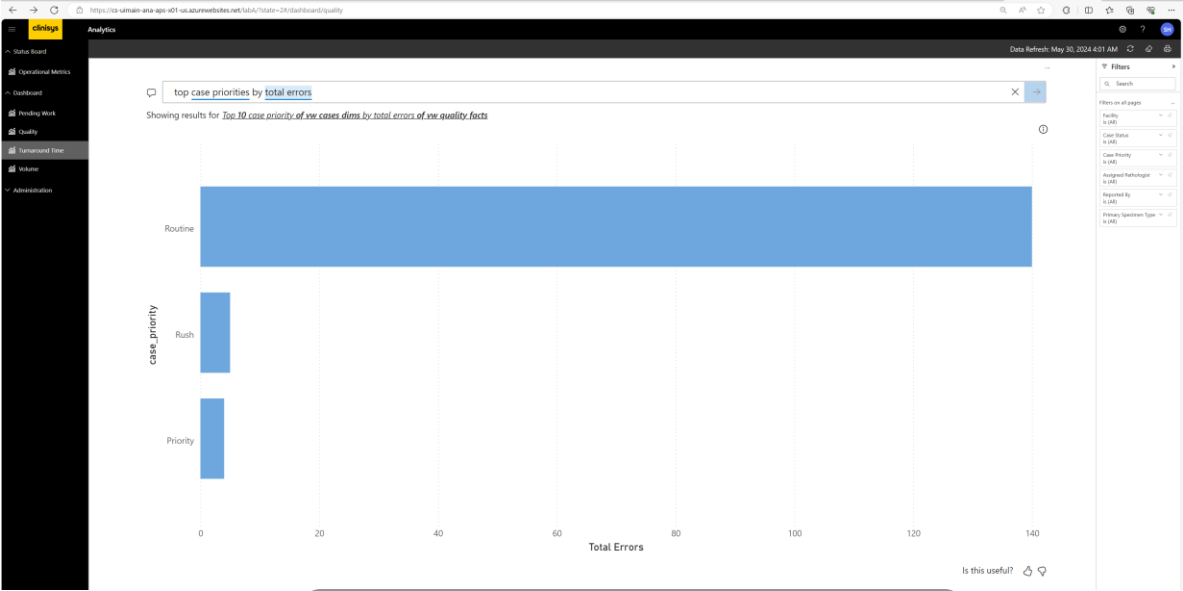
Trend & anomaly detection

- Identify trends, outliers or abnormalities in data sets to enable root cause investigations, corrective actions, and process improvements

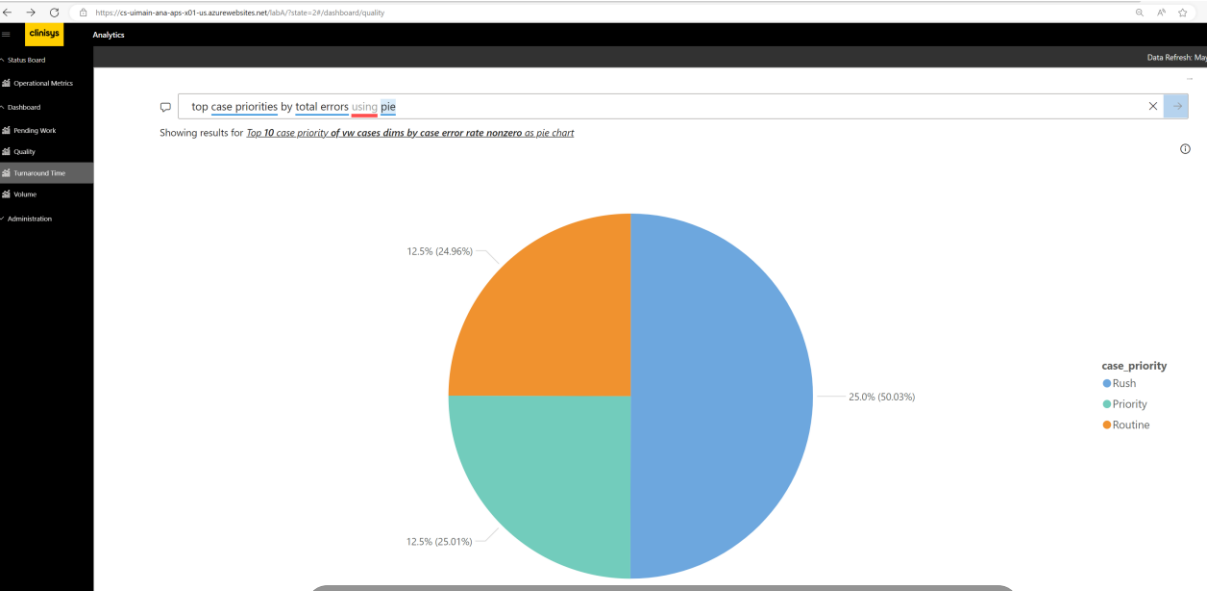
Clinisys Analytics GenAI Functionality



User types request. GenAI offers suggestions.



Dashboard is Generated via GenAI in real time

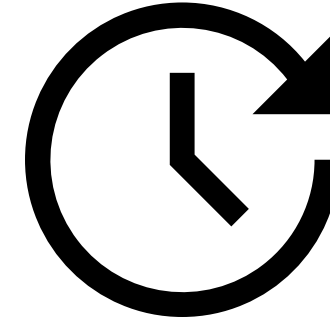


User can specify report / analysis to adjust the content

Predictive Analytics

Forecasting future trends and events

Historical Data +
Machine Learning



- Workflow optimization
- Inventory management
- Equipment maintenance

- Staffing needs
- Identify Outliers
- Future Outcomes

Which use case would be most helpful to you?

Polling Question

- Task Automation / Workflow Optimization
- Pattern Recognition / Data Analysis
- Knowledge Management / Research
- Content Generation / Transcription / Note Taking
- Operational Analytics

What other problems would you like to see addressed with Advanced Analytics technology?

Where to Start



- Learn the art of the possible. Become familiar with the technology.
- HOWEVER...
- *Always* start with the business case (NOT the technology!!)

```
1
2
3 #include <iostream>
4
5 using namespace std;
6
7 int main(){
8
9     cout <<"Hello World!"<< endl;
10
11     return 0;
12 }
```

- Identify your pain points and go from there
- Start small. Define clear goals and objectives. Use a pilot project approach
- Get help. Pull in experts to help. Evaluate vendor capabilities.

A few resources: GenAI 101

Generative AI

AI From A to Z: The Generative AI Glossary for Business Leaders

Help everyone in your company understand key generative AI terms, and what they mean for your customer relationships. Fun fact: This article was (partially) written using generative AI.



Generative AI is evolving at an astonishing pace. This glossary will help you get up, and stay up, to speed. [Sesame/Getty]

Ashley Eusanio
April 19, 2024 • 26 min read

Skills Training for Staff

<https://www.coursera.org/business/resources/ebook/generative-ai-productivity-playbook>

Glossary

<https://www.salesforce.com/blog/generative-ai-glossary/>

coursera



Executive Summary

Unlocking Productivity: The Business Leader's Playbook to Generative AI Skills Training

Featuring insights from learning experts on the future of GenAI and work

Eighty-nine percent of executives listed either AI or Generative AI (GenAI) as one of their top three tech priorities for 2024—yet 90% of those same respondents described themselves as AI “observers.”¹

The desire to unlock productivity with GenAI is all around us, but executives don't quite know where to start. If they move too fast, they risk hitting ethical and regulatory hurdles. And if they move too slow, they find themselves outpaced by competitors.

So, how can business leaders strategically upskill their teams for GenAI, sparking newfound innovation and productivity?

“

Your workforce needs simplicity. Show them basic prompt engineering with a language model, and make examples relevant to the learner.



Dr. Jules White
Director of the Initiative on the Future of Learning & GenAI, Vanderbilt University

A few resources: GenAI via Microsoft CoPilot

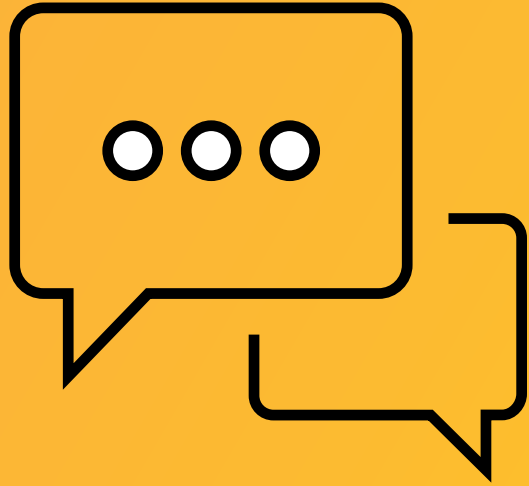
Familiarity through Daily Use

The image shows a web browser window displaying the website for the Environmental Measurement Symposium (EMS) 2023. The URL is <https://envirosymposium.group/about.php>. The website header includes the text "NEXT MEETING: MINNEAPOLIS, MINNESOTA - JULY 31 - AUG 3 2023" and the main title "Environmental Measurement Symposium" with the subtitle "a combined meeting of the Forum on Environmental Accreditation and the National Environmental Monitoring Conference". A navigation menu includes "Home", "About EMS", "EMS 2024", "2024 Program", "Previous Conferences", and "Register".

The main content area is titled "Environmental Measurement Symposium" and contains three sections: "Information For..." with buttons for "Attendees", "Exhibitors", "Presenters", "Innovative New Technology Showcase", and "Charlie Carter Award"; "Forum on Environmental Accreditation" with a description of the conference; and "National Environmental Monitoring Conference (NEMC)".

Overlaid on the right side of the browser is the Microsoft Copilot chat interface. It shows a chat window with a "Chat" tab and a "Compose" button. A suggested prompt reads: "Outline the steps to write and publish an e-book, including marketing tips". Below this, a message says "Hi, see what's possible with Copilot in Edge". There are two suggested actions: "Generate page summary" and "Suggest questions about this page". A "Choose a conversation style" section has three buttons: "More Creative", "More Balanced" (which is selected), and "More Precise". At the bottom, it says "Copilot uses AI. Check for mistakes. [Terms](#) | [Privacy](#)". The input field contains the text "Ask me anything..." and has icons for image, voice, and text input.

Built into Microsoft Edge



Thank you
Any Questions?

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Enabling healthier communities

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