

[RE]IMAGINE EDUCATION

A weekly Design AI newsletter



JUMPSTARTING RESEARCH WITH AI: SUTD LIBRARY'S CUSTOM GPT

Mr. Joel Teo, Library

In Conversation with Dr. Nachamma Sockalingam, OSP



Joel Teo,
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In a world where information is abundant, but time is limited, finding a strong starting point for research can be daunting. Whether you're diving into a new thesis topic, exploring ideas for a grant, or supporting a class project, the initial search often feels overwhelming.

That's where the Academic Research Jumpstart Scanner steps in. Developed by Joel Teo from the SUTD Library, this custom GPT delivers a sharp, topic-focused overview and a curated list of academic articles, all in minutes. But this is more than just a shortcut; it's a call to explore how Generative AI can be used meaningfully in academia.

In this issue, Joel shares how the tool was built, the challenges of AI hallucinations and broken links, and how the newest AI models helped solve them. His insights invite us to go beyond convenience toward ethical, effective, and critically engaged use of AI in research.

If you're wondering how to get started with GenAI in your accelerating academic exploration, or how to build your own Custom GPT tools, this newsletter is for you.

This newsletter is produced with ChatGPT and other AI tools as super-collaborators. The authors contribute the core ideas, drafts, strategic framing, pedagogical insights, and design direction, while AI supports by refining, formatting, and creative articulation. (CC BY-NC-ND 4.0).

Editor of Newsletter:

Dr. Nachamma Sockalingam, Office of Strategic Planning



Joel, could you introduce yourself and share a bit about what you do at SUTD?

Sure! I lead Research Services at the SUTD Library, where I support students and faculty in navigating the research process, from crafting effective search strategies to locating key information for strategic projects. I also head Pillar Relations and Collection Development, ensuring that we have the right resources to support teaching and learning across the university. Lately, I've been exploring how AI can enhance or even reimagine the services we provide, and I'm always open to collaborations in that space.

You mentioned exploring how AI could enhance library services. Can you tell us more about the custom GPT you built and what inspired it?

Absolutely. After attending a custom GPT workshop at SUTD by LKYCIC Centre, I started thinking seriously about how we could use AI to streamline one of the biggest pain points in academic research, which is getting started with academic research.

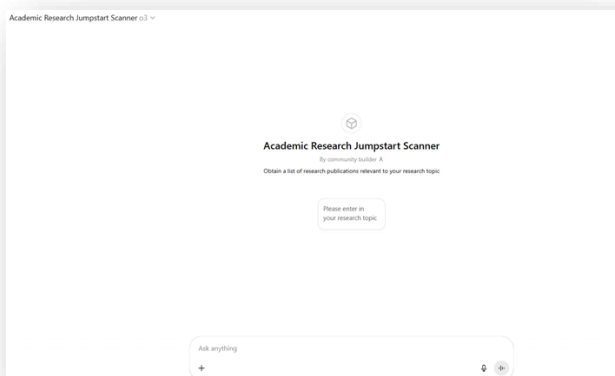
At the Library, we often help students and faculty develop search strategies or locate papers, but those early steps can still be time-consuming. That's what led to the Academic Research Jumpstart Scanner.

It's a custom GPT designed to give users a quick yet meaningful starting point. You enter your research topic, and within minutes, the tool provides a concise topic overview, highlights opportunities, gaps, and challenges, and recommends a curated list of academic articles for further reading. It's perfect for thesis prep, course projects, grant writing, or even entrepreneurial research.

That is interesting. How can we access the custom GPT?

You can access through this QR link.

Academic Research Jumpstart Scanner



<https://chatgpt.com/g/g-TlhDtIMsq-academic-research-jumpstart-scanner>



That sounds incredibly useful. Who's it for and how do you see people using it?

It's open to anyone in the SUTD community - students, faculty, researchers, or staff. Whether you're exploring a new idea or need to orient yourself before diving into deeper research, the scanner acts like a springboard. It helps you map the landscape quickly. Of course, it's not meant to replace rigorous research or a detailed literature review but it definitely accelerates the process and helps you focus your effort. It can be used for

- Academic Research
- Research Topic Exploration
- Course Projects
- Thesis and Dissertation Research
- Grant applications
- Entrepreneurship activities

What were some challenges you faced when building it?

Oh yes—plenty! Let me walk you through the main ones:

1. Hallucinations

This is probably the most common issue when working with large language models, and we experienced it early on. When we started developing the GPT in August 2024, we noticed it sometimes generated information that sounded convincing but wasn't actually true. We tested a range of prompts to reduce this, and while it helped a little, it didn't completely solve the problem. Things got a lot better once the OpenAI o3 model came out. There was a noticeable jump in accuracy. Still, we always remind users: do your due diligence and verify what the AI tells you.

2. Link Issues

Another big one. We wanted the tool to provide direct links to sources, so users could easily check the references. But initially, links were missing, broken, or just not clickable. We added prompt instructions to remind the GPT to include valid and working links, and to double-check them. Again, it was hit-or-miss—until the o3 model came in. After that, the tool became much more reliable in generating proper, verifiable links.

3. Due Diligence

This one's more of a principle than a technical issue. No matter how smart these models get, there's always a risk of error. So, we made it a point to keep reminding ourselves—and our users—that AI output needs to be treated with care. It can guide and accelerate your work, but you still need to apply critical thinking and fact-checking throughout.

We know that tools like Perplexity can also be useful. Why did the team decide on using Custom GPT?

That’s a great question and one we actually discussed quite a bit. We’re well aware that there are many excellent platforms out there like Perplexity, Gemini, Claude, and others, each with their own strengths. We encourage students and faculty to explore multiple tools and find what works best for their specific needs.

For our project, we chose to work with Custom GPT mainly because it was readily available through our institution’s existing access to ChatGPT’s tools. This made it easier to experiment and build quickly without additional setup or licensing hurdles. It also allowed us to iterate fast and test the tool with real users in our community. While we recognize that it’s not the only option out there, it was the most practical choice for us to prototype and demonstrate what a focused, academic-oriented GPT could do.

Give us an example of usage. What can your custom GPT do? How does it add value?

The *Academic Research Jumpstart Scanner* provides:

- An overview of the main aspects of the research topic, including opportunities, gaps, and challenges
- A curated list of relevant academic articles to support further reading

While AI-generated content requires verification by users, the tool delivers a fast and accessible starting point for understanding a research area. Tasks that previously could have taken hours — or even days — can now be completed in minutes. This enables researchers to quickly orient themselves to a topic and identify areas for deeper inquiry and even identifying potential opportunities, significantly improving research efficiency and effectiveness.

Here is an example of an enquiry and the information provided

User Prompt

i am interested in what research has been done in the last 5 years on protective coatings for ships. these coatings protect against the elements like UV rays, sea water, water, wind and other elements.



Custom GPT Response

Executive Briefing

Thought for 3m 12s >

Executive briefing: Protective marine coatings research (2021 – 2025)

1. Snapshot of the knowledge landscape

Aspect	2021	2022	2023	2024	2025*
Focus of most-cited studies	Classic Cu-based self-polishing (SPC) & silicone foul-release	Early super-hydrophobic polysiloxane & low-surface-energy fluoropolymers	Eco-benign / biocide-free antifouling & nano-additives	Graphene, MXene, CeO ₂ & other functional nanofillers (multi-functionality)	Smart, self-healing & dual anti-fouling + anti-corrosion “all-in-one” coatings
Key performance drivers	Drag reduction; lifetime ≥ 5 y	UV / abrasion durability	Lower biocidal load; LCA data	Thermal conductivity & sensor integration	Self-reporting damage, 3-D printed textures
Regulatory backdrop	IMO Biofouling (rev. 2023) → biocide limits	EU Green Deal life-cycle rules	ISO 19030 fuel-saving verification	CII & ETS push decarbonisation	Zero-emission shipping pilots

*2025 covers papers accepted or published up to 14 Jul 2025, Singapore time.

Last 5-Years Literature

2. What the last five years of literature tells us

Thematic cluster	Representative findings & metrics	Notable papers
Graphene & 2-D nanofillers	Single-layer graphene in epoxy raises thermal conductivity from 0.178 → 1.239 W m ⁻¹ K ⁻¹ and delays salt-spray failure beyond 2 000 h ScienceDirect	<i>High-Efficiency Graphene/Epoxy Composite Coatings (2024)</i>
Super-hydrophobic & silicone hybrids	Contact angles ≥ 160°, corrosion rate drop by 4 orders of magnitude after 30-day immersion ScienceDirect	<i>Superhydrophobic Anti-Corrosion Coating: Advancing Research (2024)</i>
Eco-benign / biocide-free antifouling	Fouling coverage < 1 % after 12-month static raft test with photocatalytic TiO ₂ /TaN hybrid; zero Cu leachate	<i>Photocatalytic Antifouling Coating (2024)</i>
MXene, CeO ₂ & functional oxides	Ti ₃ C ₂ T _x /MXene-reinforced hydrogel lowers corrosion current density by 90 % and shows self-cleaning under 2 kPa water jets ; CeO ₂ nano-coating halves Cu dissolution from SPC paints	<i>MXene & CNF Hydrogel (2024); Improved Antifouling and Anticorrosion Performance of CeO₂ (2025)</i>
Self-healing & self-reporting systems	Micro-capsule-based polyurethane heals 50 µm scratches within 6 h and restores 98 % impedance; mechano-chromic dyes give colour change within 2 min	<i>Smart Self-Healing & Self-Reporting Coatings – Overview (2025)</i>



Custom GPT Response

Research Gaps and Challenges

3. Research gaps & challenges

1. **Long-term, real-ocean validation** – <15 % of recent studies exceed 12-month immersion or in-service trials; synergistic UV-salt-abrasion data are scarce .
2. **Ecotoxicology of nano-additives** – Zn-Al LDH, MXene, CeO₂ show sub-lethal effects on *Artemia* and micro-algae at 5–50 mg L⁻¹; thresholds for IMO approval remain undefined [ScienceDirect](#) .
3. **Interface durability under flexure** – Graphene and ceramic flakes improve barrier properties but can create stress concentrators that accelerate cracking in cyclic swell (+/-25 °C).
4. **Scalability & cost** – Functional 2-D fillers drive material cost up 3-fold; roll-to-roll or slurry-spray routes are only at pilot scale.
5. **Sensor integration** – Value-of-information models show hull thickness SHM is valuable [arXiv](#) , but compatible coating-embedded electrodes are still experimental.

Emerging Opportunities

4. Emerging opportunities

- **Regulatory pull** – IMO CII & EU ETS monetise fuel savings, making drag-reducing foul-release systems financially attractive.
- **Dual-function “green” stacks** – Layered designs (zinc primer + graphene mid-coat + silicone top-coat) achieve < 2 g m⁻² day⁻¹ Cu release and ≥ 5 % propulsion-power cuts.
- **3-D printed or textured coatings** for niche areas (thruster tunnels, ballast vents) give localised turbulence control.
- **Self-monitoring smart paints** that fluoresce or change impedance enable just-in-time grooming, reducing micro-plastic paint flake release.



Custom GPT Response

Trends

5. Characteristic trends (chemistry & structure)

Family	Typical matrix	Functional fillers	Primary function(s)	TRL*	
Epoxy nanocomposites	bis-A & novolac	Graphene, SiC, CeO ₂	Anti-corrosion, thermal dissipation	6-7	
Polysiloxane hybrids	PDMS, F-Si copolymers	Nano-SiO ₂ , TiO ₂	Foul-release, UV resistance	7-8	
Hydrogel / polymer networks	PEG-Si hybrids	MXene, CNF	Lubricity, self-healing	4-5	
Ceramic / MAO layers	Al / Mg oxide	MXene, LDH	Hard-wear, anti-biofouling	4-6	
Smart self-healing	PU, urea-formaldehyde capsules	pH-triggered inhibitors	Scratch repair, corrosion inhibition	3-5	

*Technology readiness level estimated from reported field or demo trials.

Latest 30 relevant academic papers

Latest 30 relevant academic papers (2021 – 2025)

- Research Progress of Marine Anti-Corrosion and Wear-Resistant Coating –**
<https://www.sciencedirect.com/science/article/abs/pii/S0301679X24006169>
- Progress in Marine Antifouling Coatings: Current Status and Prospects –**
https://www.researchgate.net/publication/375298440_Progress_in_Marine_Antifouling_Coatings_Current_Status_and_Prospects
- High-Efficiency Graphene/Epoxy Composite Coatings with Enhanced Thermal Conductivity –**
<https://www.sciencedirect.com/science/article/abs/pii/S1359835X24001490>
- Renewable Super-Hydrophobic Antifouling Composite Silicone-Based Coating –**
<https://www.sciencedirect.com/science/article/abs/pii/S026635382500079X>
- Transitioning towards Environmentally Benign Marine Antifouling Coatings –**
https://www.researchgate.net/journal/Frontiers-in-Marine-Science-2296-7745/publication/370063650_Transitioning_towards_environmentally_benign_marine_antifouling_coatings



Can you walk us through what a typical user experience looks like with the Jumpstart Scanner? What kind of output can they expect—and how should they use it responsibly?

When someone enters a research topic into the Jumpstart Scanner, the GPT takes just a few minutes to generate a concise snapshot of that topic. This includes an overview, potential opportunities, knowledge gaps, and key challenges related to the area. What's really helpful is that it also provides the sources for this information, so users can verify the details and dive deeper if they choose to. It also gives you a curated list of academic publications that are directly relevant to your topic. This saves users a lot of time—they get a sense of direction almost instantly, rather than spending hours digging through search results.

That said, it's important to remember that this tool is meant to jumpstart your research—it's not a replacement for a proper literature review or a deep dive into the field. Once you have that initial clarity, we still recommend using structured research strategies and working with our library team to build a more comprehensive view.

Finally, where do you see this heading next? What's your vision for AI-powered tools in academic research at SUTD?

I see tools like the Jumpstart Scanner becoming a stepping stone, not just for students, but for anyone trying to explore a new topic quickly and meaningfully. My hope is that we can expand this into more specialized GPTs tailored to different disciplines or research needs. But more importantly, I want to continue the conversation on how we use AI thoughtfully—balancing speed with depth, and convenience with critical thinking.

We're also keen to hear from the community—what works, what could be better, and where AI can support learning or research more effectively. So, if you have ideas, feedback, or want to build something together, come talk to us.

This is just the beginning.