

Topic Selection and Foundations of Literature Review

ST5188 Advanced Data Science Project
 2024/2025 Semester 2

ST5188 @ Canvas: <https://canvas.nus.edu.sg/courses/72737>

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Reminder: Lecture Attendance & Participation

• For In-person and Zoom Live Stream Attendees

- You are expected to complete all activities during lecture time.
 - Activities: *Scan the QR codes* located in the top right corner of the respective slides.
- Your attendance will be tracked automatically.

• For Recording Viewers (via Canvas' Panopto)

- You must watch the lecture from start to finish (→ tracking is done per second).
 - Activities: *Use the direct activity links* shared via Canvas Announcements and complete all activities by the end of Monday following the original lecture date.
 - Please note that QR codes do not work in lecture recordings at this time.

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Content Overview

- Reminders & updates (incl. **consultation sessions** and **project pitch approach**)
- **Strategies for** identifying and **selecting a project topic**
- **Scoping the literature**: Balancing breadth and depth
- **Critical analysis of sources**: Demonstrating an understanding beyond summaries.
- **Connecting the literature to your own group's project**
- Q & A

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Reminders

- ~~Jan 20th, noon:~~ ~~Self-registration for project groups closes~~
- Jan 21st: Release final project group / TA allocations
- Jan 21st, 5pm: Second lecture (@ LT34 / Zoom)
- Jan 22nd: Consultation bookings available
- **Jan 27th:** **Third lecture** (available as recording only due to CNY)
- Jan 27th: Consultation sessions commence
- Jan 31st, noon: Book first consultation session (or we will schedule it for you)
- Feb 8th: Project Proposal submission deadline

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ST5188 Advanced Data Science Project (AY 2024/25, Semester 2)

– Course Guide –

Version 1.0

ST5188, which will be conducted in a **hybrid mode**, is a **project course**. Throughout the semester, students will work (in groups) on their projects independently. However, there will be dedicated touch points with facilitators including **six lectures, five consultation sessions** (for each group) with the lecturer, and **ongoing TA support**.

Given that ST5188 is a project course, it is evaluated as such. Different students may contribute in different ways; according to their skills, abilities and project plan agreed upon by the whole group. However, **all students are expected to contribute similar efforts** to the project.

All the students in a group share **equal responsibility** for creating team spirit and making the group work as a whole. Should a problem arise, each student must be willing to work towards resolving the problem. **Do not hesitate to ask your assigned TA for mediation**; should problems persist, the TA will escalate the matter to the lecturer.

ST5188 assessment components are as follows:

	Contribution	Due Date	Late Submission (25% penalty applies)
Class Participation ⁽ⁱ⁾	10%	n/a	n/a
Project Proposal ⁽ⁱⁱ⁾	15%	Feb 9 th , 11:59pm	Feb 11 th , 11:59pm
Project Progress Report ⁽ⁱⁱ⁾	10%	Mar 16 th , 11:59pm	Mar 18 th , 11:59pm
Project Presentation ⁽ⁱⁱ⁾	15%	Week 13	n/a
Final Project Report ⁽ⁱⁱ⁾	40%	Apr 20 th , 11:59pm	Apr 22 nd , 11:59pm
Code Reproducibility ⁽ⁱⁱ⁾	10%	Apr 22 nd , 11:59pm	n/a

⁽ⁱ⁾ Individual assessment component; ⁽ⁱⁱ⁾ group-based assessment component

There will be **six MANDATORY lectures** (conducted in LT34 and streamed via Zoom). Lectures are held in weeks 1, 2, 3, 4, 5, and 7; Tuesdays 5–7pm.

For course details and updates, please refer to the [ST5188 Canvas page](#).

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ST5188 Lectures

Jan 14th, 5pm: **ST5188 Introductory Briefing Session**

- Jan 21st, 5pm: **Topic Selection and Foundations of Literature Review**
- Jan 27th: **How to Write an Effective Capstone Project Proposal**
 - Note, due to CNY, this lecture will be made available as recording only.**
 - Project proposal guidance & expectations
 - Key terms explained
 - Good practises versus bad practises
- Feb 4th, 5pm: **Project Planning, Management and Execution in Data Science**
- Feb 11th, 5pm: **Data Science Best Practises Part 1 (Data)**
- Mar 4th, 5pm: **Data Science Best Practises Part 2 (Model Development and Evaluation)**

All lectures are 90mins each & conducted in LT34 / streamed via Zoom;
recordings will be made available within 2 business days.

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ST5188 TA – Project Group Allocation

Ms. Anusri Suresh Kumar <ul style="list-style-type: none"> • Dept of Physics • Email: e1353409@u.nus.edu • Responsible for groups PG09 – PG16 	Mr. Pushkar Kale <ul style="list-style-type: none"> • Dept of Stats & Data Science • Email: pushkar.kale@u.nus.edu • Responsible for groups PG25 – PG32 	Ms. Shiqi Wu <ul style="list-style-type: none"> • Dept of Mathematics • Email: wushiqi@u.nus.edu • Responsible for groups PG17 – PG24 	Mr. Shen Tao <ul style="list-style-type: none"> • Dept of Stats & Data Science • Email: taoshen@u.nus.edu • Responsible for groups PG01 – PG08
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Project Group Structure & Next Steps

1. Get to Know Each Other
 - Kick-off session: Take some time for a quick introduction session to get to know each other. **Discuss your backgrounds, strengths, working styles, and expectations.** This will help build rapport, especially in groups with members who haven't worked together before.
2. Organize Your Group
 - **Elect a Project Manager:** Select a project manager to coordinate efforts and keep the team on track.
 - **Define roles & responsibilities:** Assign roles to each group member based on individual strengths, ensuring a balanced workload.
3. Topic Selection
 - Collaborate on topic choice: Work together to **select potential project topics that align with the group's interests and capabilities.** Seek guidance from your TA if needed.
4. Commence Literature Search & Review
 - **Start building your knowledge base:** Begin your literature search, focusing on relevant academic and industry sources to form a strong foundation for your project.

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Project Manager Core Responsibilities

- Leadership & Coordination
 - Organize **regular team meetings**, set agendas, track action items.
 - Ensure communication and **alignment on goals** and timelines.
- Task Management
 - Assign and manage tasks **fairly** among team members.
 - **Track progress** and ensure deadlines are met.
- Stakeholder Communication
 - **Liaise with stakeholders** (e.g., professor and assigned TA) and provide regular updates.
 - Ensure feedback is effectively communicated and integrated.
- Quality Control & Submission
 - Oversee the **quality of deliverables** and coordinate final reviews.
 - Ensure on-time submission and organize the project presentation.
- Notables:
 - **Project Manager also contributes individually**, with reduced responsibilities in the technical work.
 - Balances leadership with focused technical contribution.

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Consultation Session Bookings

- Opens Jan 22nd (and will be announced via [Canvas](#))
 - Only book one session per group for each fortnight!
 - **Weeks 3 – 4**; weeks 5 – 6; **weeks 7 – 8**; weeks 9 – 10; and **weeks 11 – 12**.
 - Bookings close at the end of the first week!
 - **Consultation sessions commence on Jan 27th.**

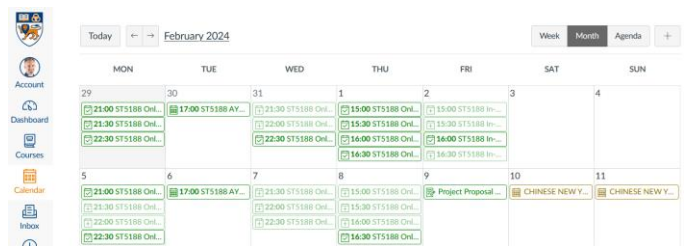
[booking your 1st consultation session]

- MUST be scheduled and attended BEFORE project proposal submission.
- We strongly recommend that you book your first consultation slot early.
- **For groups that have not made a booking arrangement by Jan 31st noon, we will schedule an online consultation session for your group.**
 - However, you will then have no choice wrt. the meeting date and time.
- Any group that fails to attend their first consultation session prior to project proposal submission will only receive their project proposal feedback once all other feedback has been returned.

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• Which sessions are mandatory / count towards class participation?

- **Weeks 3 – 4** → compulsory
- Weeks 5 – 6 → highly recommended
- **Weeks 7 – 8** → compulsory
- Weeks 9 – 10 → highly recommended
- **Weeks 11 – 12** → compulsory

Consultation Sessions: Preparation Matters!

- Each group can book **up to 5 consultation sessions** (30 mins each).
- Objectives:
 - Seek clarification / guidance / feedback to help with your project's progress or decisioning.
- What **not** to expect / ask:
 - The lecturer will not run those session; **you are expected to do so!**
 - We will not preview / pre-mark assignments / submission documents.
 - We will not make decisions for you!
- Consultation sessions run from the middle of week 3 to the end of week 12.

[in advance]

- **Send a summary** (limited to half a page / two paragraphs) **of your project idea, project progress, key discussion points, ... PRIOR** (at least 3 hours!) **to the consultation session to the lecturer directly** (CC your assigned TA).

[during the session]

- Be on time.
- **Have a (written) agenda prepared.**
 - What do you want to ask or seek clarification / guidance / feedback on?
 - Provide sufficient context.
 - Prioritise your agenda items!
- Have supplementary information readily available.
- Respect the meeting time.

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Lessons to be Learnt from ST5188 Students

Project Planning and Management:	Problem Statement and Objective Clarity:	Data Management and Model Selection:	Skill Development and Knowledge Enhancement:	Team Dynamics and Collaboration:	Adaptability and Experimentation:	Presentation and Reporting:	Personal Attitude and Approach:
<ul style="list-style-type: none"> • Many students emphasized the importance of better planning, including creating detailed weekly plans and managing time more efficiently. • Some students expressed a desire for earlier and more frequent team meetings, improved communication, and more proactive engagement with teaching assistants and professors. • A few mentioned they would start their tasks earlier to avoid last-minute rushes. 	<ul style="list-style-type: none"> • Clarifying the problem statement and project objectives early on was a common theme. Students realized that a clear understanding of the project goals from the start would guide their research and model development more effectively. • Some regretted not doing enough preliminary research or literature review to understand and define their project's scope and objectives. 	<ul style="list-style-type: none"> • A significant number of students would put more effort into selecting and understanding their data sets, as well as in choosing appropriate models. • There was an interest in exploring a wider range of models, including less-complex ones, to enhance learning and understanding. 	<ul style="list-style-type: none"> • Many students would focus more on improving specific skills such as Python coding, deep learning, academic writing, and understanding of machine learning algorithms. • Several mentioned the need for more comprehensive literature reviews and better understanding of data science concepts. 	<ul style="list-style-type: none"> • Improving team dynamics was a concern. Some students would choose their teammates differently or allocate tasks more effectively. • There was an interest in engaging more with classmates for diverse perspectives and more effective group contributions. 	<ul style="list-style-type: none"> • A willingness to adapt their approach, try different methodologies, and experiment with various data sets and models was expressed. • Some students showed interest in exploring new topics or adding components like sentiment analysis to their projects. 	<ul style="list-style-type: none"> • Improving the quality of project proposals and reports was a focus. Students recognized the importance of meeting project requirements and expressing ideas clearly. • Enhancing presentation skills and better expressing project motivations and achievements were also mentioned. 	<ul style="list-style-type: none"> • A few students expressed contentment with their original approach but would make minor adjustments, like starting earlier or focusing more on certain aspects. • A proactive mindset, better engagement in discussions, and a deeper dive into course material were among the improvements suggested.

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Project Idea Pitching Session Approach ^(new)

- No Separate Pitching Session
 - The pitch will serve as a pre-cursor to your consultation session.
- Submission Deadline
 - Send your **1-page pitch** (up to 3 ideas) at least **2 working days before your consultation session**.
 - To both, the lecturer (Markus.Kirchberg@nus.edu.sg) and your assigned TA
- Feedback Turnaround
 - We will revert with comments within 1 to 1.5 business days.
- Template & Samples
 - Available via Canvas

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Key Activity 2: Project Formulation & Project Proposal	
Project Proposal Submission	13 pps
STS188 Project Idea Pitch Template.pdf	
STS188 Project Idea Pitch Examples.pdf	
STS188 Submission Template - Project Proposal - Word.docx	
STS188 Submission Template - Project Proposal - LaTeX.zip	
STS188 Evaluation Rubric - Project Proposal v1-0.pdf	

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Project Idea Pitch (Template)

- Topic
 - Briefly state the **subject area** of your project.
- Use Case
 - Describe **the scenario or context** in which the data science solution will be applied.
 - Indicate which **stakeholders** or industries will benefit.
- Problem Statement
 - Clearly **define the real-world issue or gap** in current practices.
 - **Emphasize why this gap matters** (impact on cost, user experience, efficiency, etc.).
 - Avoid describing solution methods or objectives here.

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Project Idea Pitch (Example – Excellent)

Topic

Early Detection of Tomato Leaf Blight via Smartphone Imagery

Use Case

Small-scale tomato farmers in the southern regions of Country X often rely on visual inspection to catch early signs of fungal blight. Because of limited access to on-site labs, even a few infected plants can quickly spread disease across a large portion of the field. Prompt identification and response is vital to prevent costly losses, particularly for cooperatives that rely on tomato sales.

Problem Statement

Currently, farmers struggle to detect leaf blight in its initial stages without specialized equipment or expert support. This delay leads to late or ineffective treatments, increasing production costs, and endangering livelihoods. The absence of a fast and affordable way to check for early infection puts smallholders at risk of substantial yield losses.



Photo: Tomasz Klejdysz / Getty Images

- **Specific and narrow gap:**
 - Zeroes in on leaf blight detection for tomato farmers in a particular region.
- **Immediate real-world impact:**
 - Demonstrates how late detection directly increases costs and threatens livelihoods.
- **Clear stakeholders:**
 - Small-scale farmers and cooperatives who depend on timely crop protection.
- **Purely problem-focused:**
 - Avoids outlining potential solutions or objectives, staying on the gap itself.

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Strategies for Identifying and Selecting a Project Topic

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Topic Selection: Commonly Raised Questions

- How do we get started?
- How do we refine our ideas and narrow down different ideas effectively as a group?
- How do we decide on the final topic?
- What if we do not manage to agree?



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The Importance of Topic Selection

Selecting the Right Topic

- Why Selecting the Right Topic is Crucial
 - **Sets the stage** for the research question and direction of the study.
 - Determines the scope and scale of the research project.
 - **Influences engagement and motivation** throughout the research process.
 - Affects the applicability and impact of research findings.
- Synergy in Topic Selection
 - Collaborative selection ensures **a range of interests and expertise are considered**.
 - A shared topic can **foster a sense of ownership and commitment** among all group members.
 - The diversity of the group can lead to a **more multifaceted and robust research** direction.

Impact

- Impact on Research Direction and Outcomes
 - A well-chosen topic can lead to significant contributions to the field.
 - Ensures the **research is manageable and can be completed within given constraints**.
 - Impacts the researcher's ability to secure funding and resources.
 - Determines the **potential for publishing / disseminating research**.
- Impact on Group Research Direction and Outcomes
 - A jointly selected topic can **enhance group cohesion and facilitate cooperative learning**.
 - It sets a clear, common goal that can **improve group productivity and the quality of outcomes**.
 - The right topic can accommodate the varied academic strengths of group members, leading to a **more comprehensive approach to the research question**.

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Strategies for Topic Selection I/II

Brainstorming Techniques

- **Mind Mapping:** Create a visual diagram that shows the relationships between different aspects of a broad subject.
 - Helps to visually organize complex topics into subtopics and see the connections between ideas, facilitating a more comprehensive discussion.
 - Example: Begin with "Predictive Analytics" at the center; branch out into industries such as healthcare, finance, and retail; further branch into topics like predictive models, data privacy, and real-time analytics, ...
- **Free (Exploratory) Writing:** Individually write down your thoughts on a subject without worrying about structure, grammar, or even making sense.
 - Can unearth innovative ideas and perspectives that might not emerge in a structured discussion.
 - Example: Independently, write about "Natural Language Processing" to uncover unique applications, such as sentiment analysis for social media or translation algorithms for real-time communication.
- **The Five Ws:** Dissect a subject by asking Who, What, Where, When, and Why.
 - Structured approach to narrowing down broad topics into more specific and researchable questions.
 - Example: For "Machine Learning in Weather Forecasting", ask:
 - Who will benefit from improved models? (e.g., farmers, logistics companies)
 - What data sources are most predictive? (e.g., satellite imagery, historical weather patterns)
 - Where can machine learning make the most impact? (e.g., regions with extreme weather)
 - When do models need to be most accurate? (e.g., during seasonal changes)
 - Why is machine learning better than traditional methods? (e.g., ability to process vast datasets)
- **SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis:** Assess the viability and potential impact of a topic.
 - Example: Analysing "Deep Learning for Image Recognition" could reveal strengths like high accuracy, weaknesses such as data sensitivity, opportunities in new application areas like autonomous vehicles, and threats from regulatory challenges around data use.
- **Six Thinking Hats:** Think in six different ways (six coloured "hats") to explore topics from different perspectives.
 - Can lead to a more rounded understanding.
 - White Hat (data and information); Red Hat (feelings, hunches, and intuition); Black Hat (critical judgment); Yellow Hat (benefits and opportunities); Green Hat (creativity and new ideas); Blue Hat (process control).
- **Starbursting** (questioning brainstorming): Focus on generating as many questions as possible about a potential topic.
 - Helps in understanding all facets of the topic and what research could uncover.
 - Example: For "Statistical Methods in Genetic Data Analysis", questions might include:
 - How can statistics help in predicting genetic disorders?
 - What statistical models best handle the complexity of genetic data?
 - Why is it important to include diverse data in genetic research?
 - Who will be the primary users of this research?

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Strategies for Topic Selection II/II

Brainstorming within Groups

1. **Round Robin:** Each member presents an idea in turn.
 - Prevents dominance by any single member; ensures equal participation.
 - Example: Each member suggests an application of statistical methods in different industries, such as healthcare, finance, and marketing, to ensure a variety of potential research avenues are covered.
2. **Idea Building:** Expand upon the ideas presented by others.
 - Fosters a collaborative environment where ideas are not just listed but also developed.
 - Example: Building on an idea of "predictive models in healthcare", one member might suggest focusing on predictive models for patient re-admissions, while another could propose expanding to predictive maintenance of medical equipment.
3. **Dot Voting:** To converge on one or a few topics, each member can use a limited number of votes (dots) to indicate their preferences.
 - The ideas with the most dots move forward for further consideration.
 - Example: If the group generated 10 potential topics, each member could have three votes to allocate. The topics with the most votes are then selected for further exploration.

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Dealing with Group Dynamics

- **Nominal Group Technique:** A structured method for group brainstorming that prevents the influence of other group members during idea generation.
 - Everyone writes down their ideas independently before sharing them with the group.
 - Example: Members independently consider the viability of using "neural networks to analyse satellite imagery for climate change research" before sharing and discussing as a group.
- **Delphi Method:** Involves a series of questionnaires sent to group members, with summaries of the responses shared after each round.
 - Gathers the informed judgments of experts while preventing any one person from having undue influence.
 - Experts iteratively refine their opinions on complex topics like "optimization algorithms in logistics" until a consensus is reached on the most pressing research questions.
- **Affinity Diagramming:** After generating many ideas, use affinity diagrams to organize and prioritize them.
 - Groups ideas based on natural relationships, helping to synthesize complex information into clear themes.
 - After brainstorming, ideas related to "real-time analytics in Internet of Things (IoT) devices" are grouped into categories such as data collection, processing, and actionable insights.

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Topic Selection: A Structure Approach

1. **Getting Started:**
 - **Brainstorm Ideas:** Begin by brainstorming a wide range of potential topics. Encourage every group member to contribute ideas, ensuring a diverse range of perspectives.
 - **Consider Course Objectives:** Align your ideas with the course objectives. Does the topic meet ST5188 Project Selection criteria (→ refer to Lecture 1)?
 - **Research and Inspiration:** Look into current trends in data science, review academic journals, and consider real-world problems that intrigue your group.
 2. **Refining and Narrowing Down as a Group:**
 - **Evaluate Relevance and Feasibility:** Assess each idea's relevance to your course and its feasibility in terms of data availability, time constraints, and required expertise.
 - **Discuss Interests and Strengths:** Consider the interests and strengths of each group member. A topic that aligns with your collective skills and passions is more likely to succeed.
 - **Prioritize Ideas:** Use criteria like interest level, resource availability, potential impact, and scope to prioritize and narrow down the topics.
 3. **Deciding on the Final Topic:**
 - **Vote or Consensus:** After narrowing down the options, decide on the final topic either by voting or reaching a consensus. Ensure that every member's opinion is heard and valued.
 - **Consult Your Lecturer or TA:** If you're unsure, seek guidance from your lecturer or teaching assistant. They can provide valuable insights on the suitability and scope of your chosen topic.
 4. **Dealing with Disagreements:**
 - **Open Discussion:** If there's a disagreement, facilitate an open discussion where each member can express their concerns and preferences.
 - **Compromise and Collaboration:** Sometimes, combining elements from multiple ideas can create a topic that satisfies everyone.
 - **Mediation:** If disagreements persist, consider seeking mediation from your assigned TA or the lecturer. They can provide an outside perspective and help resolve conflicts.
 5. **Additional Considerations:**
 - **Ethical Implications:** Evaluate the ethical implications of your chosen topic, especially regarding data privacy and usage.
 - **Scalability and Depth:** Consider if the topic can be scaled appropriately to fit the project's scope and whether it allows for sufficient depth of analysis.
 - **Future Opportunities:** Think about how the project could potentially contribute to your portfolios or career goals.
- Remember, the topic selection process is as much about learning to work collaboratively as it is about the project itself!
- It's a great opportunity to practice communication, negotiation, and decision-making skills that are valuable in any data science career.









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Guide from Ideation to a Clear Project Direction

	Brainstorm & Ideation	Gather interests & scan for potential data sources Narrow down feasible ideas (align with your group's skills)
	Topic Selection	Check practical relevance & team buy-in Ensure scope fits 9 weeks (→ feasibility)
	Use Case / Scenario	Identify context & stakeholders Highlight day-to-day impact
	Problem Statement	Pinpoint what's missing or failing Emphasize consequences (why does it matter to address)
	Gap Analysis	Note existing approaches (what is currently being done) Outline limitations or shortcomings (go beyond the why)
	Objectives	Set clear, measurable targets (keep them realistic) Align with the identified gap

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Scoping the Literature Review: Balancing Breadth and Depth

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Literature Review Expectations

General Guidance

- **Purpose:**
 - To justify the need for the proposed research.
 - To **demonstrate familiarity with the field** and to **identify gaps that the proposed research is intending to fill**.
- **Content:**
 - A broad overview of the field to situate the proposed research within the larger academic conversation.
 - Identification of gaps in the existing literature that the research will address.
 - Review of methodologies and findings of previous research to justify the chosen approach.
- **Breadth and Depth:** [context: project proposal]
 - Typically, **broader in scope to show the research space** and to argue the proposal's relevance.
 - May not delve into excessive detail about each source but should provide enough depth to substantiate the research need.
- **Style:**
 - Persuasive, aiming to convince the reader of the importance and viability of the proposed research.
 - Forward-looking, discussing how the proposed research will contribute to the field.

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Specific ST5188 Expectations

- A literature review is a **descriptive summary of prior research on your chosen topic** (with particular focus on the problem statement).
- **Purpose 1:** Inform readers of the significant **knowledge and ideas that have been established**.
 - *We evaluate breadth, depth, and inclusion of recent (i.e., past 5 years) literature!*
- **Purpose 2:** **Compare, contrast and/or connect** findings that were identified when reviewing researchers' work.
 - *We evaluate whether the review demonstrates a deep understanding of nuances and contrasts in the literature, rather than just summaries!*
- **Purpose 3:** Establish an **educational research context for your own research project**.
 - Identify what is known about the topic and the problem statement that you are studying.
 - Are there any gaps, shortcomings and/or failures?
 - Provide a broad and critical analysis of relevant literature.
 - Cite all sources!
 - *We evaluate whether there are connections between the reviewed literature and your project's intentions!*

Effective Literature Scoping: Breadth vs. Depth

- **Breadth: Contextualizing Your Project**
 - **Current Landscape Mapping:** Include a spectrum of contemporary research to showcase the evolution of thought and practice up to the current state-of-the-art.
 - **Interdisciplinary Insights:** Draw from related fields to enrich the context and demonstrate the project's innovative angle.
 - **Trend Synthesis:** Outline major trends and how they converge on the problem space your project is addressing.
 - **Depth: Critical Engagement Over Textbook Repetition**
 - **Integrate Advanced Concepts:** Focus on recent studies (i.e., past 5 years) that extend beyond what's covered in textbooks.
 - **Analytical Depth:** Evaluate seminal works and recent research to provide a sophisticated understanding relevant to your project.
 - **Research Gap Identification:** Highlight how your project addresses unanswered questions or applies theories in new contexts.
 - **Avoiding Bad Practices**
 - **Eschew Redundancy:** Do not reiterate basic concepts well-established in foundational courses.
 - **Reject Disconnected Breadth:** Ensure all literature mentioned has clear relevance to your project's objectives.
 - **Forego Isolated Analysis:** Avoid focusing on studies without discussing their relation to your project's aims and methodology.
 - **Connecting Literature to Your Project**
 - **Direct Relevance:** Each piece of literature reviewed should directly inform your project's approach and rationale.
 - **Practical Application:** Discuss how theoretical insights from the literature will be applied practically in your project.
 - **Methodological Justification:** Use the literature to justify the design, methods, and potential impact of your project.
- **Dynamic Balance:** Maintain a living document approach, where the literature review evolves with your project's development.
- **Purposeful Narrative:** Construct a literature review that tells the story of your project's place within the academic and practical landscape.

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The Importance of Recent Literature

- **Why Recent Literature is Key?**
 - **ST5188 Course Requirement:** Learn BEYOND what was covered in prior coursework.
 - **Rapid Advancements:** Data science is a swiftly evolving field. What's cutting-edge today might be commonplace tomorrow.
 - **Reflecting Current Trends:** Demonstrate awareness of the latest trends, techniques, and discoveries related to your chosen topic.
- **Academic Focus**
 - **Relevance / Validity of Findings:** Utilize recent literature to ensure that your project is grounded in the latest (or, at least, recent) scholarly work.
 - **Evolving Theories and Techniques:** New theories and analytical techniques emerging in recent publications can provide fresh perspectives and approaches.
- **Practical Relevance**
 - **Online Notebooks as Emerging Sources:** Online notebooks (e.g., Kaggle, GitHub, Jupyter) can serve as valuable resources for contemporary data science practices, offering real-world examples, code, and datasets.
 - **Critical Evaluation:** BUT, critical assessment of these sources is essential!
- **Industry Relevance**
 - In industry contexts, 'recent' may have a different meaning / time-scale; **focus is often more on proven, stable technologies** rather than the latest innovations.
 - Delicate balance between adopting innovative data science techniques and ensuring the stability and reliability of solutions.
- **Sourcing Recent Literature ([NUS Libraries Resource Guides](#))**
 - **Academic Journals:** Focus on peer-reviewed journals for cutting-edge research.
 - **Conferences and Workshops:** Seek out proceedings for the latest discussions and unpublished works.
 - **Online Databases:** Use databases like PubMed, IEEE Xplore, and Google Scholar with filters set to the last 3-5 years.
 - **Research Networks:** Leverage platforms like arXiv, ResearchGate and Academia.edu to access pre-publication studies.

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Utilizing Online Notebooks in Literature Reviews

- **Incorporating User-Generated Content**
 - **Critical Assessment:** Evaluate the credibility of the authors and the robustness of the methodologies presented in online notebooks.
 - **Cross-Verification:** Cross-check any findings or methods with peer-reviewed sources or replicate the results independently.
 - **Transparency of Sources:** Prioritize notebooks that provide clear data provenance and version control for reproducibility.
- **Navigating Online Notebooks as Sources**
 - **Kaggle Notebooks:** Acknowledge as a source of innovative approaches and practical insights but corroborate with academic research.
 - **GitHub Repositories:** Review for collaborative and evolving projects, ensuring to identify stable and well-documented releases.
 - **Jupyter Notebooks:** Reference for detailed, executable examples of code, while carefully considering the date of the last update and user feedback.
- **Best Practices for Using Online Notebooks**
 - **Citation with Caution:** Cite notebooks as supplementary material, not as primary evidence, and detail their role in informing your project.
 - **Quality over Quantity:** Choose high-quality, well-received notebooks over a large number of less scrutinized ones.
 - **Ethical Considerations:** Ensure that the use of data and code from notebooks adheres to licensing agreements and ethical standards.
- **Including Online Notebooks in Your Review**
 - **Documentation of Process:** Record your evaluation process for each online source, including steps taken for verification.
 - **Reflective Analysis:** Discuss the relevance and application of notebook content to your research, noting any limitations or discrepancies.

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Critical Analysis of Sources: Demonstrating an Understanding Beyond Summaries

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The Process of Writing a Literature Review

- Must be **shaped by research** which provides a background to the topic. Your review should be **selective**.
 - Common mistake: Include everything you have read regardless of its relevance.
 - Key criteria: **Relevance to your project** and **importance to the field / use case**.
- Key activities: **Analysing and synthesising previous research**.
 - Analysis and synthesis may appear to be two opposing methods: *"Whereas analysis involves systematically breaking down the relevant literature into its constituent parts, synthesis is the act of making connections between those parts identified in the analysis"* (Bloomberg & Volpe, 2012, p.84).
 - However, you will notice the synergy between analysis and synthesis as you **zoom-in to closely analyse an individual source**, then **zoom-out to consider it in relation to the broader context**.
 - After locating and analysing a range of sources, you should synthesise the relevant sources.
 - Synthesising means **connecting, linking & positioning sources against each other to identify the recurring themes, trends and areas of agreement / disagreement**.
- Develops an argument based on a critical analysis, synthesis and evaluation of the literature under review.
 - Literature review is essentially **conducting research on the research that others have completed**.
 - Report of your findings on the patterns, trends and gaps you have found in the existing literature, presented as your own argument.
 - For example, you could develop an argument about controversies, discrepancies and patterns in the field of study.

Source: "The Process of Writing a Literature Review", Monash University, Australia; <https://www.monash.edu/student-academic-success/excel-at-writing/how-to-write/literature-review/the-process-of-writing-a-literature-review>
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Critical Analysis of Sources

Critical Analysis of Sources

- **Evaluating Research Quality:**
 - **Assess the credibility** of the authors and their affiliations.
 - **Examine the methodology** for robustness and appropriateness.
 - Check for biases, **assumptions, and limitations** in the study.
- **Approaching Critical Reading:**
 - Read **actively, questioning the arguments** presented and the evidence used.
 - Look for **connections and discrepancies** within the literature.
 - Summarize key points in **your own words** to ensure understanding.

Synthesizing Research Findings

- **Comparative Analysis:**
 - Identify common themes and divergent viewpoints across different studies.
 - Use Venn diagrams or comparison tables to visualize similarities and differences.
- **Organizing Findings:**
 - Create a synthesis matrix to categorize and compare data across multiple sources.
 - Use mind maps to explore relationships between different pieces of literature.

Developing Critical Insights

- **Question the 'why' and 'how'** behind research findings.
- **Look beyond** what the study says to what it implies!

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Connecting the Literature to Your Own Group's Project

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Linking Literature to Your Project

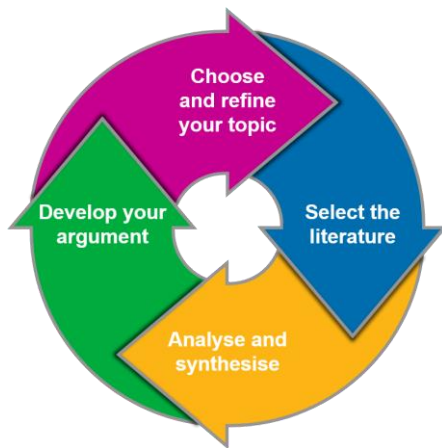
- **Set in Context**
 - Relate the studies / finding to your project's use case.
- **Aligning with Problem Statement & Objectives:**
 - Map out how each piece of literature supports or challenges your research questions / problem statement.
 - Use the literature to set the stage for your research, showing how it addresses a gap or extends current knowledge.

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Putting it All Together



1. Define the scope of your literature review

- Choose and refine your topic (problem statement and objectives, and inclusion and exclusion criteria).
- Guides your search strategy and help you narrow down your results.

2. Identify possible sources and assess their credibility

- Check the author's credentials, the publisher's reputation, the source's accuracy, and the peer-review status.
- Use sources that are written by experts in the field, published by reputable organizations or journals, based on valid and reliable data, and verified by other scholars (Google Scholar, Scopus, or Web of Science; citation counts and impact factors).

3. Evaluate the relevance to your research question and objectives

- Read the abstract, introduction, and conclusion of each source to get a sense of its main argument, findings, and implications.
- Compare and contrast different sources to see how they relate to each other and to your topic.
- Use sources that are directly relevant to your project, provide sufficient background and context, and offer new insights or perspectives.

4. Evaluate sources for their rigor

- Examining the quality and appropriateness of the research design, methods, analysis, and interpretation.
- Assess how the authors justified their research question, selected their sample, collected and analyzed their data, and reported their results.
- Identify any limitations, biases, or ethical issues in the research process.
- Use sources that are based on sound and transparent methods, clear and consistent logic, and valid and reliable evidence.

5. Synthesize the sources

- Summarizing, comparing, and synthesizing the main points, themes, and gaps in the literature.
- Relate the sources to your own problem statement & objectives and show how they contribute to your knowledge and understanding.

6. Cite the sources

- Follow a consistent and appropriate citation style, such as APA, MLA, or Chicago.

Source: "The Process of Writing a Literature Review"; Monash University, Australia; <https://www.monash.edu/student-academic-success/excel-at-writing/how-to-write/literature-review/the-process-of-writing-a-literature-review>
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Questions?

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Can I Make Use of LLMs like ChatGPT?

- **Allowed:** Seeking clarifications, understanding concepts, and brainstorming.
- **Not Allowed:** Direct copy-pasting, generating full essays, or replacing independent thought.
- **Always Cite:** If you use information from LLMs, ensure you credit appropriately.
 - But how? → [NUS Guidelines on the Use of AI Tools For Academic Work](#)
- **Ethical Responsibility:** Academic integrity matters. Use technology responsibly.

→ Remember: The goal is to enhance learning, not bypass it.

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Thank You

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