

# Computational Models for Embedded Systems

Vescan Andreea, PhD, Assoc. Prof., Habil.

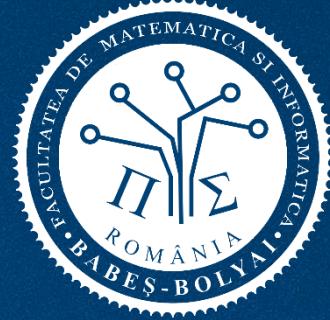


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Faculty of Mathematics and Computer Science  
Babes-Bolyai University  
Cluj-Napoca  
2025-2026



Lecture 5: SLR



# Faculty of Mathematics and Computer Science Babeş-Bolyai University

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“Tell me and I forget, teach me and I may remember, involve me and I learn.”

(Benjamin Franklin)

# Outline

## SLR report

- SLR elements
- SLR process
- SLR deliverable

## SLR - presentation

- Pecha Kucha presentation style
- Structure
- Elements to be included

## SLR - poster

- Structure
- Elements to be included

# Class schedule (tentative)

				Class	Room, hours
1	3 oct.	Introduction	Assignment 1 Problem statement. SDG UBB Goes Green (Lab 1) => Lab 7	Seminar (Friday)	L321 14-16 SDI (S2)
2	10 oct.	Model checking (1)		Seminar (Friday)	L402 16-18 258/1 (S1) 258/2 (S2)
3	17 oct.	Model checking (2)		Lecture (Friday)	C335 18-20
4	24 oct.	Synchronous Model			
5	31 oct.	Asynchronous Model	Assignment 2 Model checking JSpin (Lab 2, Lab 3) => Lab 7		
6	7 nov.	Invited lecture: Automotive by Synopsys			
7	14 nov.	Finite State Machine (1)			
8	21 nov.	Invited lecture: Keeping Rails in Check by Accenture			
9	28 nov.	Finite State Machine (2)	Assignment 3 a) Finite State Machine b) Petri Nets (Lab 4, Lab 5, Lab 6) => Lab 7		
10	5 dec.	Petri nets			
11	12 dec.	Timed models Invited lecture (1): Keeping Rails in Check by Accenture (pending?)			
12	19 dec.	Hybrid systems			
		Holiday			
13	9 ian.	Dynamical systems			
14	16 ian.	Report Presentation, Exam preparation			

SLR Lecture  
When?

# Grading

## Final Grade

[https://www.cs.ubbcluj.ro/files/curricula/2025/syllabus/IS\\_sem3\\_MME8026\\_en\\_avescan\\_2025\\_9498.pdf](https://www.cs.ubbcluj.ro/files/curricula/2025/syllabus/IS_sem3_MME8026_en_avescan_2025_9498.pdf)

- To be Updated about the Grading (after this first lecture)
  - Research
    - Dissertation Thesis
    - Internship in Specialization
- To be UPDATED?  
10-Oct-2025
- Final Grade = 50% Seminar (=10%\*Pb+20%\*MC + 20%\*FSM) + 50% Exam (=10%Quiz+40%\*ReportSLR)
  - Conditions to participate at the final exam
    - There is no restriction regarding the participation at the written examination regarding obtained marks Pb, MC, FSM.
  - Pb, MC, FSM work may not be redone in the retake session.
  - Conditions to pass/complete the CMES discipline:
    - Final Grade >= 5 final grade.

<http://www.techedupteacher.com/gamify-your-class-level-i-xp-grading-system-2/>

## Gamify Your Class

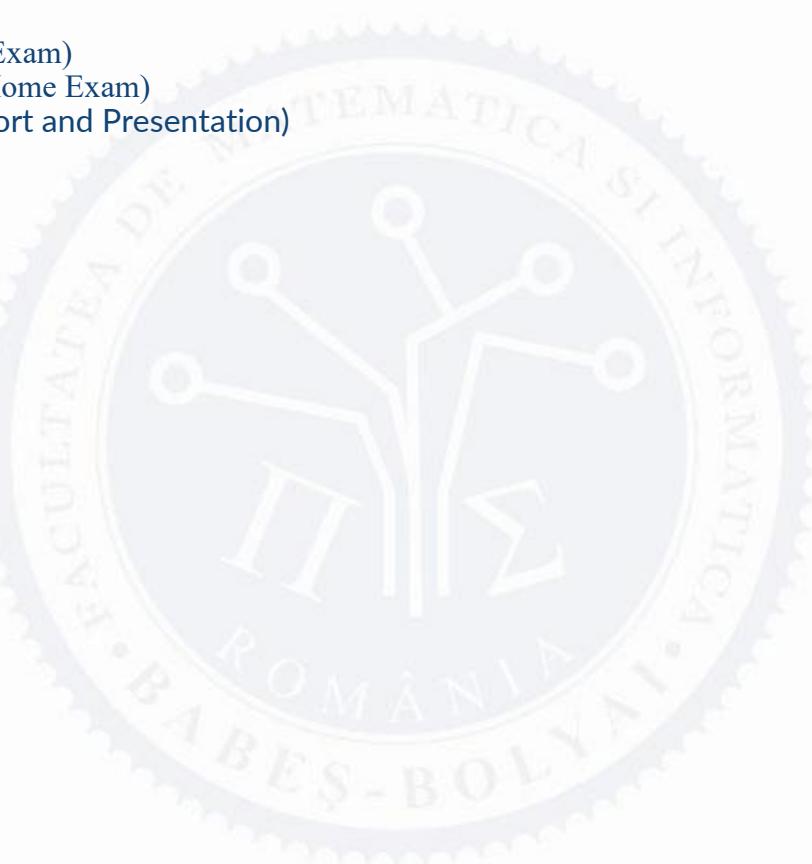
	Side Quests (Lab projects)	Epic Quests (Final exam)
Normal session	Pb + MC + FSM 1500 XP	Up to 1500 XP (Quiz 300 + ReportSLR 1200 XP)
Retake session	Received during Normal session <small>Points obtained in the didactic activity period (labs and seminar and bonus activity cannot be redone in the normal/retake session).</small>	Up to 1500XP

XP intervals	Grade
[1400,1500]	5
[1501,1800]	6
[1801,2100]	7
[2101,2400]	8
[2401,2700]	9
Over 2700	10

Final exam – you must come (be present) to the final exam in order to compute the grade!

# Epic Quests (Final exam)

- Up to 1500 XP
  - 300 XP – Quiz (In Class Exam)
  - 1200 XP – Report (Take Home Exam)
    - Social Quests (Report and Presentation)



# Social Quests (Report and Presentation)

- Up to 1200 XP
- Conduct a Systematic Literature Review on a provided research topic.
  - Testing Embedded systems or Quality attributes of Embedded Systems or Internet of Things or
- References
  - Barbara Kitchenham, Procedures for Performing Systematic Reviews, 2004
  - Barbara Kitchenham, Guidelines for performing Systematic Literature Reviews in Software Engineering, 2007
  - Example: PhD Thesis (Chapter 3)
- Team: 3-5 students/team
- Tasks (48h:12=4h/week)
  - 01. Search and save the title (doi) of the articles (minimum 30 articles) (6h)
    - 01.a. showballing procedure
  - 02. Read abstracts and reduce from 30 to 10 papers (6h)
  - 03. Read each of the 10 papers
    - 03.a. create standardized data extraction form = all relevant information for each study, allowing you to examine and compare results.
    - 03.b. produce 1 paragraph (approach, used method, dataset, obtained results) (3h\*10articles=30h)
  - 04. Summarizing table with the 10 articles (6h)
    - 04.a. Tabulating extracting data
  - 05. Future work and opportunities
    - 05.a. Discussions of results
    - 05.b. Gaps, challenges, open issues
    - 05.c. Opportunities/Recommendations
  - 06. Report containing
    - Explain the methodology applied (all the steps and findings regarding various characteristics of the selected articles).
    - The 10 paragraphs and the Summarizing table and Future work and opportunities.
  - 07. Presentation of the SLR process and results – Pecha Kucha presentation type (10 minutes)

Tasks  
for one  
student  
in the  
team

Each student from the team selects  
30 papers and reduces to 10 papers

3 students=30 papers (starting from 90 papers)  
4 students=40 papers (starting from 120 papers)  
5 students=50 papers (starting from 150 papers)

You can create an account here  
<https://www.e-nformation.ro/> (use  
@scs.ubbcluj.ro account) and download the  
papers. If the papers are not available, please  
email the teacher the doi id of the paper.

## SLR report template

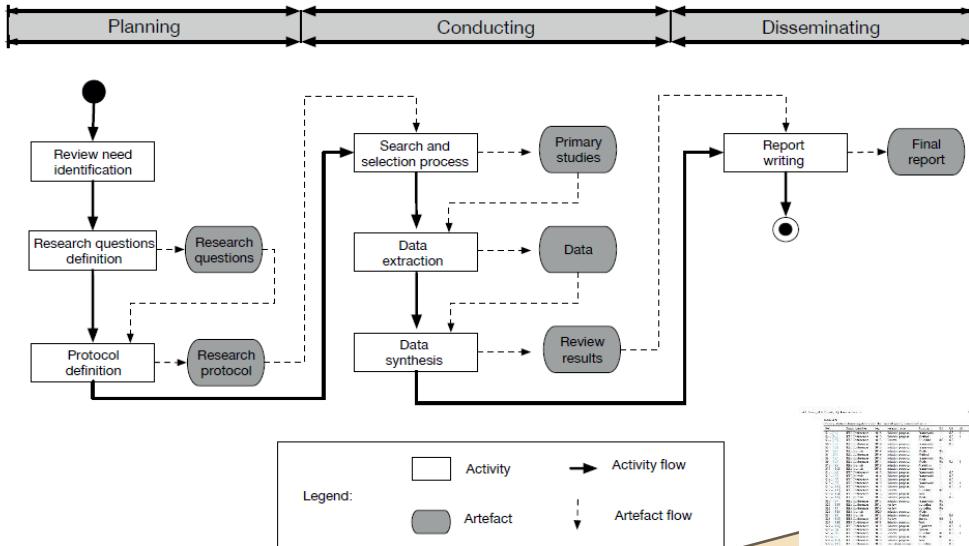
<https://www.overleaf.com/9296348645hvshcgfbkkt>

Create a copy and change the names for Student1 and Student2 and Student3 (2024\_CMES\_SLR\_Student1Student2). Please do not write in the shared project (it is just for copy).

## SLR Report pdf + Recorded 10min Video + Poster

Must be submitted in Teams under the Assignment Assignment\_SRL\_Report – one day before exam date

# SLR (1)



- Excel file - For each line:
  - Paper information
  - Characteristics related to the aim/topic and to the RQ
    - Example: approach, used method, dataset, etc
    - Minimum 7

**Examples**  
Kitchenham et al. [21] used the extraction form shown in Table 7 (note the actual form also included the quality questions).

Data item	Value	Additional notes
Data Extractor		
Data Checker		
Study number	81	
Application domain	Space, military and industrial	
Name of the organization	European Space Agency (ESA)	
Number of projects in database (including within company)	108	
Number of cross-company projects	60	
Number of projects in within-company data set	29	
Software used		
SP (Yes/No)		
FP (Yes/No)		
Version control		
LLOC (Yes/No)		
Version used		
Others (Yes/No)		
Number of companies	37	

K. Kitchenham et al. [21] used the extraction form shown in Table 7 (note the actual form also included the quality questions).

Table 7 Data Collection form completed for Maxwell et al., 1998

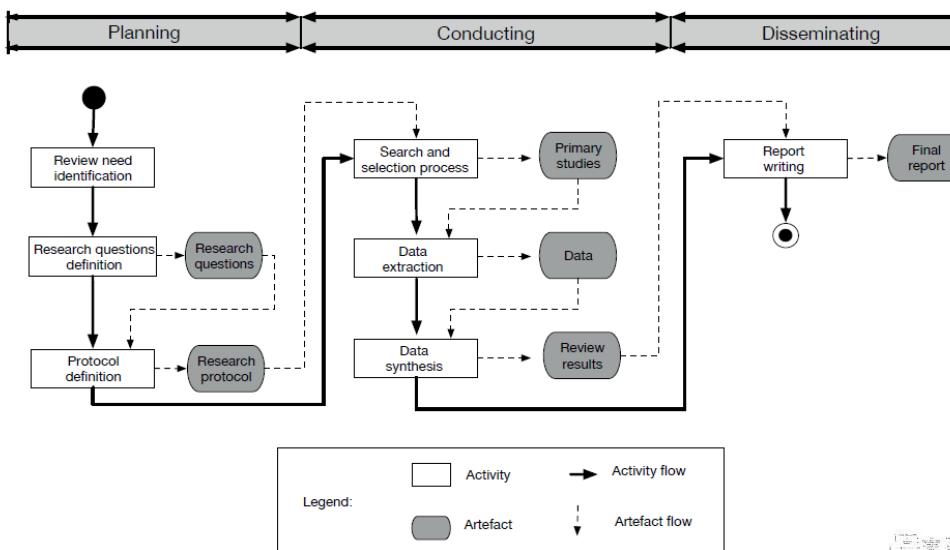
Category	Attribute	Value	Notes
Project Info	Project Title (a2)	SM - Testing embedded software	
	Project ID	V10	
Project Manager	First name	A.	
	Last name	Maxwell	
Project Description	Type of testing activity	Unit testing	
	Test environment	Test execution	
Project Status	Initial status	Not yet started	
	Current status	Not yet started	
Project Environment	Hardware	PC	
	Software	Windows 95	
Project Tools	IDE	Visual Studio	
	Test tool	TestComplete	
Project Data	Number of test cases	100	
	Number of test cases passed	0	
Project Metrics	LOC	1000	
	Time spent	100 hours	
Project Resources	Number of people	1	
	Number of hours per person	100	
Project Risks	Number of risks	10	
	Severity of risks	Medium	
Project Issues	Number of issues	10	
	Severity of issues	Medium	
Project Documentation	Number of documents	10	
	Size of documents	1000 pages	
Project Configuration Management	Number of configurations	10	
	Size of configurations	1000 pages	
Project Version Control	Number of versions	10	
	Size of versions	1000 pages	
Project Locus	Number of Loci	10	
	Size of Loci	1000 pages	
Project Version	Number of Versions	10	
	Size of Versions	1000 pages	
Project Other	Number of Others	10	
	Size of Others	1000 pages	

Figure 3: A screenshot from the online repository of papers ([www.gutenberg.org/](http://www.gutenberg.org/))

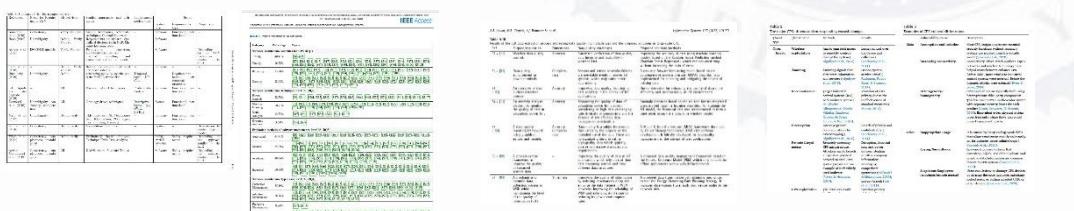
In this step, we aim to enlarge the set found by the automatic search from previous steps, through a snowballing activity [33]. Through the snowballing activity, we referred to each study and used its reference list to identify additional studies. Several potential studies were identified but after applying the

- Example: PhD Thesis (Chapter 3)
- Team work
  - Chosen Topic: the same for all students in the team
  - Define Research Questions (RQ)
  - Define Keyword and Search string
- For each student in the team
  - 01. Search and save the title (doi) of the articles (minimum 30 articles)
    - 01.a. showballing procedure
  - 02. Read abstracts and reduce from 30 to 10 papers
  - 03. Read each of the 10 papers
    - 03.a. create standardized data extraction form = all relevant information for each study, allowing you to examine and compare results.
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    - Explain the methodology applied (all the steps and findings regarding various characteristics of the selected articles).
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  - 07. Presentation of the SLR process and results – Pecha Kucha presentation type (10 minutes)
  - 08. Poster

# SLR (2)



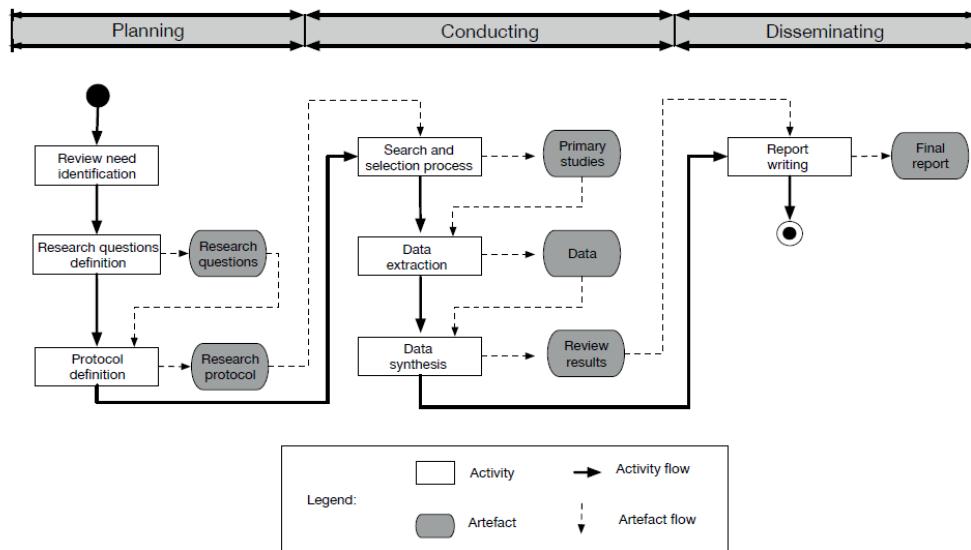
- Table with the extracted data
  - Details regarding the paper and various characteristics
  - Minimum 5 characteristics



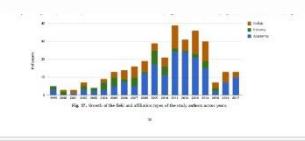
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**SLR (3)**



- Results
    - Various types of charts for analysis
      - Minimum 5 charts
    - The research questions are repeated and an answers are provided.

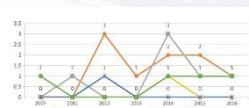


A bubble chart showing the relationship between UCI Measurement type (Y-axis) and ICB Distribution (X-axis). The Y-axis categories are: Temperature, Acceleration, Velocity, Position, and Workload. The X-axis categories are: Unimodal, Bimodal, Trinomial, and Multimodal. The size of each bubble represents the number of drivers (N), ranging from 1 to 12. The chart shows that most measurements (Temperature, Acceleration, Velocity, Position) are unimodal, while Workload is multimodal. Workload also has the largest number of drivers (12).

UCI Measurement	ICB Distribution	N
Temperature	Unimodal	1
Acceleration	Unimodal	3
Velocity	Unimodal	4
Position	Unimodal	11
Workload	Unimodal	1
Workload	Bimodal	1
Workload	Trinomial	5
Workload	Multimodal	2

The graph displays the percentage of children aged 0-5 years with diarrhoea over time. The y-axis ranges from 0.0% to 0.5%. The x-axis shows years from 2008 to 2014. The legend indicates four series: Soho (blue), EC2 (red), London (green), and England (yellow). All series show a significant increase starting around 2011, peaking between 2013 and 2014.

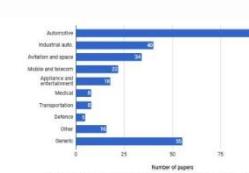
FIGURE 9. Papers by year and by date



Maintenance Technique	Count of Publications
General	22.7%
Refactoring	30.6%
Reuse	12.0%
Migration	3.6%
Configuration	0.0%
Other	0.0%

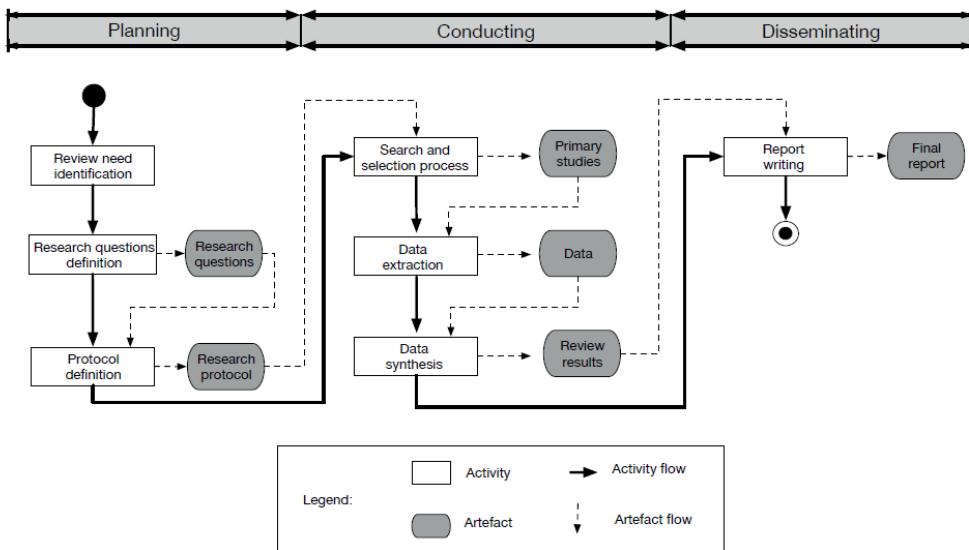
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    - 08. Poster



10/31/2025

# SLR (4)



In this step, we aim to enlarge the set found by the automatic search from previous steps, through a snowballing activity [33]. Through the snowballing activity, we referred to each study and used its reference list to identify additional studies. Several potential studies were identified but after applying the

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- Challenges and open issues
- Opportunities/Recommendations

## 6. Perspectives and future direction

### V. IMPLICATIONS AND FUTURE RESEARCH

#### DIRECTIONS

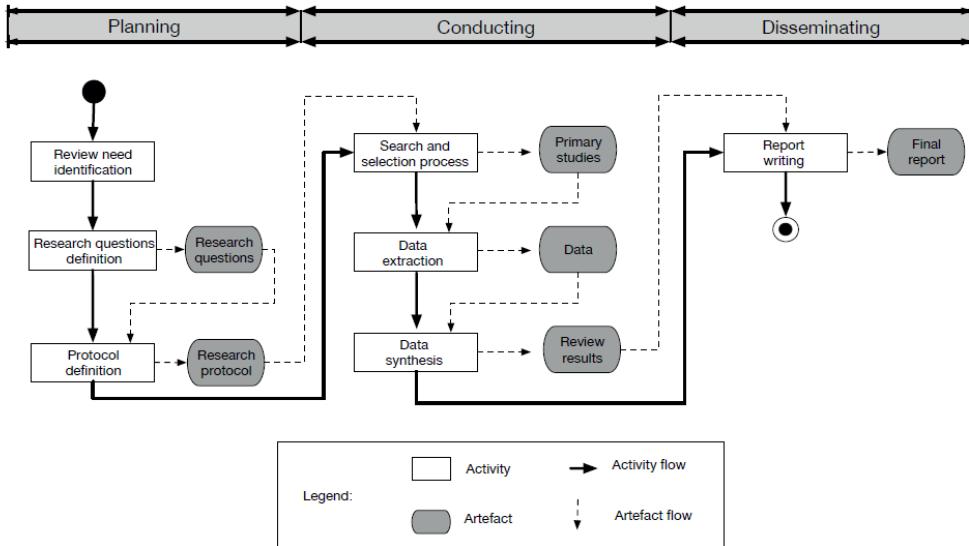
In this section, we identify new opportunities for future

#### 4.2.1 | Open challenges involving unaddressed areas

#### 4.2.2 | Open challenges involving unutilized approaches and unaddressed testing problems

### 5.2. Discussion and open research topics

# SLR (5)



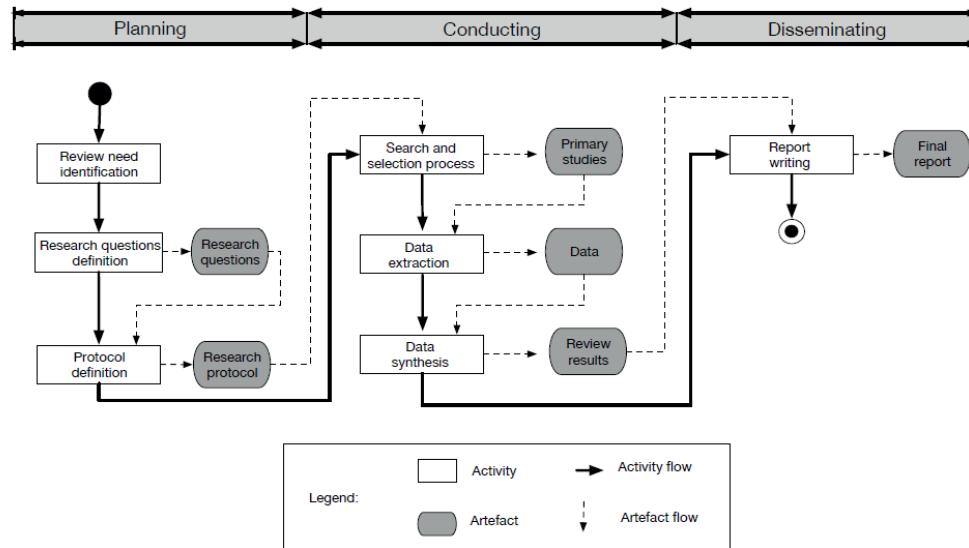
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  - Define Research Questions (RQ)
  - Define Keyword and Search string
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  - 08. Poster

- Content of the Video presentation
  - Explain the methodology that you have used.
  - Research questions
  - Results discussion
  - Answers to the Research questions
  - Open issues + Opportunities
- Mandatory
  - First slide:
    - CMES subject, SLR report
    - Name of the students
    - year
  - Your voices
  - Use pictures to enhance your idea
  - Use your own charts and tables from your performed analysis.

- See video examples provided in the SLR assignment.
- See Poster examples provided in the SLR assignment.

# SLR (6)



## Turn in:

- One excel file containing:
  - Final list of selected papers included in your SLR as a team.
    - Excel file with one sheet containing the list (for each paper, year, title, authors, conference or journal, link of the online publication)
  - Data extraction form
    - Excel file with one sheet containing the table with the characteristics that you have chosen for each the included paper in the SLR.
  - Tabulated data
    - Excel file with one sheet containing the table with the result analysis.
  - Charts with your analysis
    - Excel file with one sheet (or multiple sheets) containing the performed analysis that contains the charts you have created based on your analysis.
- PDF file with the SLR report (use the provided template; you can update it based on your need)
- Video presentation of your SLR activity.
- Poster

In this step, we aim to enlarge the set found by the automatic search from previous steps, through a snowballing activity [33]. Through the snowballing activity, we referred to each study and used its reference list to identify additional studies. Several potential studies were identified but after applying the

## Example: PhD Thesis (Chapter 3)

### Team work

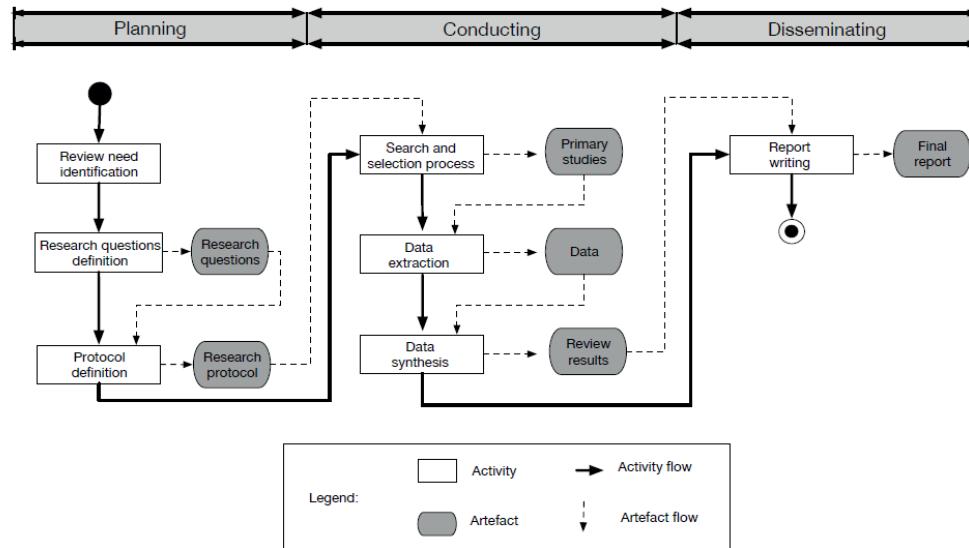
- Chosen Topic: the same for all students in the team
- Define Research Questions (RQ)
- Define Keyword and Search string

### For each student in the team

- 01. Search and save the title (doi) of the articles (minimum 30 articles)
  - 01.a. showballing procedure
- 02. Read abstracts and reduce from 30 to 10 papers
- 03. Read each of the 10 papers
  - 03.a. create standardized data extraction form = all relevant information for each study, allowing you to examine and compare results.
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# SLR (7)



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    - Excel file with one sheet containing the list (for each paper, year, title, authors, conference or journal, link of the online publication)
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  - Tabulated data
    - Excel file with one sheet containing the table with the result analysis.
  - Charts with your analysis
    - Excel file with one sheet (or multiple sheets) containing the performed analysis that contains the charts you have created based on your analysis.
- PDF file with the SLR report (use the provided template; you can update it based on your need)
- Video presentation of your SLR activity.
- Poster

In this step, we aim to enlarge the set found by the automatic search from previous steps, through a snowballing activity [33]. Through the snowballing activity, we referred to each study and used its reference list to identify additional studies. Several potential studies were identified but after applying the

## Example: PhD Thesis (Chapter 3)

### Team work

- Chosen Topic: the same for all students in the team
- Define Research Questions (RQ)
- Define Keyword and Search string

### For each student in the team

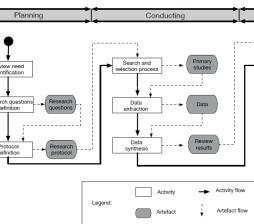
- 01. Search and save the title (doi) of the articles (minimum 30 articles)
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- 08. Poster



# SLR (8)

## 1200 XP – Report (Take Home Exam)

- Social Quests (Report and Presentation)



### 1200 XP

- 100: papers list + data extraction form
- 150: tabulated data
- 150: charts
- 150: methodology in the pdf report
- 150: paragraphs on the content of the papers
- 200: discussions+ open issues + opportunities
- 200 Pecha Kucha presentation
  - 100: methodology in short + rq+table+charts+answer to rq
  - 100: organization, content, slides, delivery
- 100 Poster

#### Turn in:

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- Video presentation of your SLR activity.
- Poster

In this step, we aim to enlarge the set found by the automatic search from previous steps, through a snowballing activity [33]. Through the snowballing activity, we referred to each study and used its reference list to identify additional studies. Several potential studies were identified but after applying the

- Example: PhD Thesis (Chapter 3)

- Team work

- Chosen Topic: the same for all students in the team
- Define Research Questions (RQ)
- Define Keyword and Search string

- For each student in the team

01. Search and save the title (doi) of the articles (minimum 30 articles)
  - 01.a. showballing procedure
02. Read abstracts and reduce from 30 to 10 papers
03. Read each of the 10 papers
  - 03.a. create standardized data extraction form = all relevant information for each study, allowing you to examine and compare results.
  - 03.b. produce 1 paragraph (approach, used method, dataset, obtained results) ( $3h * 10 \text{articles} = 30h$ )
04. Summarizing table with the 10 articles
  - 04.a. Tabulating extracting data
05. Future work and opportunities
  - 05.a. Discussions of results
  - 05.b. Gaps, challenges, open issues
  - 05.c. Opportunities/Recommendations
06. Report containing
  - Explain the methodology applied (all the steps and findings regarding various characteristics of the selected articles).
  - The 10 paragraphs and the Summarizing table and Future work and opportunities.
07. Presentation of the SLR process and results – Pecha Kucha presentation type (10 minutes)
08. Poster



# SLR (9)

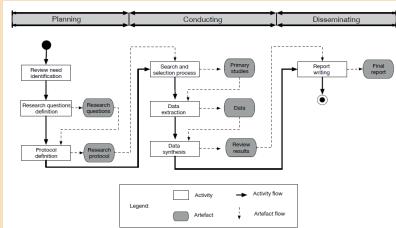
- **SLR\_and\_Video\_Example\_by\_students**
    - Discussed during the lecture (not everything is correct!)
    - 5 minutes → NOW 10 minutes
  - **Poster**
    - 1 example on overleaf:
      - <https://www.overleaf.com/latex/templates/gemini-poster-theme/nzpspqjryjhx>
    - 1 example on ptx
      - <https://management.buffalo.edu/internal/communications-tools/templates/research-poster-template.html>
    - Define ones for your own need + UBB logo (+FMI)
  - Example: PhD Thesis (Chapter 3)
  - Team work
    - Chosen Topic: the same for all students in the team
    - Define Research Questions (RQ)
    - Define Keyword and Search string
- For each student in the team**
- 01. Search and save the title (doi) of the articles (minimum 30 articles)
    - 01.a. showballing procedure
  - 02. Read abstracts and reduce from 30 to 10 papers
  - 03. Read each of the 10 papers
    - 03.a. create standardized data extraction form = all relevant information for each study, allowing you to examine and compare results.
    - 03.b. produce 1 paragraph (approach, used method, dataset, obtained results) (3h\*10articles=30h)
  - 04. Summarizing table with the 10 articles
    - 04.a. Tabulating extracting data
  - 05. Future work and opportunities
    - 05.a. Discussions of results
    - 05.b. Gaps, challenges, open issues
    - 05.c. Opportunities/Recommendations
  - 06. Report containing
    - Explain the methodology applied (all the steps and findings regarding various characteristics of the selected articles).
    - The 10 paragraphs and the Summarizing table and Future work and opportunities.
  - 07. Presentation of the SLR process and results – Pecha Kucha presentation type (10 minutes)
  - 08. Poster



# CMES – Today

# Bring it All Together

## SLR



### Extraction form

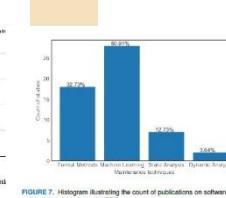


### Tabulating extracting data



### Charts

- Team: 3-5 students/team
- 30 papers for each student => reduced to 10 papers (for each student)



### Open issues Opportunities

**V. IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS**  
In this section, we identify new opportunities for future

#### 5.2. Discussion and open research topics

## SLR – turn in

### Turn in:

- One excel file containing:
  - Final list of selected papers included in your SLR as a team.
    - Excel file with one sheet containing the list (for each paper, year, title, authors, conference or journal, link of the online publication)
  - Data extraction form
    - Excel file with one sheet containing the table with the characteristics that you have chosen for each the included paper in the SLR.
  - Tabulated data
    - Excel file with one sheet containing the table with the result analysis.
  - Charts with your analysis
    - Excel file with one sheet (or multiple sheets) containing the performed analysis that contains the charts you have created based on your analysis.
- PDF file with the SLR report (use the provided template; you can update it based on your need)
- Video presentation of your SLR activity.
- Poster



# Next Lecture

- Invited lecture
  - Synopsys
- Title:
  - Virtual Prototyping for Software-Defined Vehicles
- Speaker:
  - Ana Diaconu
- In attendance:
  - Adrien Lorincz si Claudiu Ispas
- You are kindly asked to participate at these lectures, please send minimum 10 students from each semigroups.
- Fill in here the list of students:
  - [https://ubbcluj.sharepoint.com/:w/r/sites/2025\\_2026\\_Master\\_CMES/\\_layouts/15/Doc.aspx?sourcedoc=%7BE02DF2CF-96C5-4CFA-AC17-325537A94C62%7D&file=InvitedLectures\\_StudentParticipants\\_List.docx&action=default&mobileredirect=true](https://ubbcluj.sharepoint.com/:w/r/sites/2025_2026_Master_CMES/_layouts/15/Doc.aspx?sourcedoc=%7BE02DF2CF-96C5-4CFA-AC17-325537A94C62%7D&file=InvitedLectures_StudentParticipants_List.docx&action=default&mobileredirect=true)
  -

# Thank You For Your Attention!

- ExitTicket
- Mentimeter
  - [menti.com](https://menti.com)
  - Code: ?

