AI-Driven Detection and Mitigation of Urban Heat Island Effects Using Vision-Language Models

Project ID: R25-002

Logbook

Madhuwantha G K O

IT21802058

B.Sc. (Hons) Degree in Information Technology Specialized in Software Engineering

Department of Software Engineering

Sri Lanka Institute of Information Technology Sri Lanka

October 2025

Table of Contents

1.	Work Progress	3
2.	Supervisor Meeting Logs	6
3.	Meeting Notes	8
4.	Git Activity History	15
5.	Screenshots of Meetings & Mails	17
6.	Gallery	19

Table of Figure

Figure 1: Note 1	Figure 2:	: Note 2	8
Figure 3: Note 3			
Figure 5: Note 5			
Figure 7: Note 7	-		10
Figure 9: Note 9	Figure 10	0: Note 10	10
Figure 11: Note 11	Figure 12	2: Note 12	11
Figure 13: Note 13	Figure 14	4: Note 14	11
Figure 15: Note 15	Figure 16	6: Note 16	12
Figure 17: Note 17	Figure 18	8: Note 18	12
Figure 19: Note 19	Figure 20	0: Note 20	13
Figure 21: Note 21	Figure 22	2: Note 22	13
Figure 23: Note 23	Figure 24	4: Note 24	14
Figure 25: Note 25	Figure 26	6: Note 26	14
Figure 27: Git Repo			15
			15
			16
Figure 30: Git Code Co	mmits (UF	HI simulation Microservice)	16
Figure 31 : Group Meet	ting		17
			17
C			18
C			18
C			18
· ·	•	Figure 37: Validation Testing 2	c c
Figure 30. Final Present	tation Com	nnleted	10

1. Work Progress

Week	Progress
	November – 2024
Week 1	 Began brainstorming possible research areas. Discussed ideas such as coral-reef protection, IoT-based deforestation detection, and travel-planning systems. Focused on identifying a project with both innovation and social impact.
Week 2	 Continued reviewing different domains and evaluating feasibility. Compared environmental, social, and technical relevance of shortlisted topics. Supervisor guided us to align ideas with sustainability and real-world application areas.
Week 3	• Shifted focus toward urban heating problems and the Urban Heat Island (UHI) effect.
	 Supervisor mentioned a colleague from University of Lincoln (UK) researching this field.
	 Learned how AI + IoT + Digital twin simulation can help analyze and mitigate heat retention in cities.
Week 4	 Finalized UHI detection and mitigation as our main research topic. Supervisor proposed collaborating with his Lincoln colleague as external supervisor and Ms. Kaushalya Rajapakse as cosupervisor.
	 Outlined research objectives and drafted the initial problem statement.
	Prepared early documentation for proposal submission.
*** 1 1	December – 2024
Week 1	 Began preparing the TAF (Topic Assessment Form) document. Collected background details, objectives, and expected outcomes for inclusion.
Week 2	 Held a meeting to plan our research schedule. We decided to meet with supervisors every other week starting from January 2025 for progress reviews. Began early reading on AI-based environmental analysis to prepare for proposal writing.
	January – 2025

Week 1	 Started creating Charter and proposal. Met with the supervisor and co supervisor to obtain the signature for the charter document.
Week 2	Completed creating the proposal presentation
Week 3	Had our physical meeting to present the proposal presentation as trial run
Week 4	 We did the proposal presentation. Submitted proposal report (final) to the CDAP cloud
	February
Week 1	 Conducted a group meeting to discuss the proposal result. With a team meeting discussed how to begin the development.
Week 2	I gathered information on how I can develop my system and faced some difficulties.
Week 3	Discussed the issues with supervisors and identified solutions together
Week 4	 Conducted preliminary research on Urban Heat Island (UHI) phenomena and existing simulation approaches such as ENVI-met, EnergyPlus, and MATLAB Simscape. Explored thermal simulation frameworks and tools. Studied thermal properties of building materials (concrete, glass, tile, insulation). Started preparing metadata parameters like density, specific heat capacity, and thermal conductivity.
	March
Week 1	Showed my findings to supervisors.
Week 2	Began designing simulation data flow.
Week 3	Showed my progress and get feedback on how to improve the design and make the process better
Week 4	 Defined system architecture for simulation component. Continue developing the designing.
	April
Week 1	Prepared PowerPoint slides for Progress Presentation 1.
Week 2	Did the progress presentation 1.
Week 3	 Conducted a group meeting to discuss the progress presentation result.
Week 4	 Integrated GIS data and 3D building model export pipeline from Blender. Tested data format compatibility for MATLAB input (CSV).

W-1-1 - D ' MADE ADO: 101 02 00	
Week 1 • Began using MATLAB Simulink with Sims	scape Thermal
to design prototype building thermal model.	
Week 2 • Discussed with supervisor about the thermal	model issues and
contact engineering student was suggested.	
Participated in a "How to Write a Research P	
Week 3 • Started frontend design and Configured heat	
components, temperature sensors, and ambies (temperature, wind).	nt conditions
Week 4 • Developed Node.js backend pipeline to conne	ect the React
frontend with MATLAB engine.	cot the React
Configured CSV generation and file transfer	via REST API.
June	
Week 1 • Continued the updates in design and develop	ment of the web
app frontend.	
Week 2 • Implemented React + Three.js 3D visualizat	tion tool for model
viewing and metadata assignment.	
 Week 3 Added Transform Controls for moving and reinteractively. 	otating models
Week 4 • Added SunCalc.js integration to calculate su	nlight
exposure based on latitude, longitude, and tin	_
July	
Week 1 • Displayed exposure using heatmap overlay or	
Designed simulation data export to CSV inch	
Thickness, Density, Thermal Conductivity	-
Capacity, Sun Exposure, Temperature, Hun Speed.	many, and wind
Week 2 • Began writing our research paper.	
Reviewed existing research papers related to	our component to
support the writing of our research paper	1
Week 3 • Sent our written research paper to the supervi	isor for checking.
Week 4 • Revised the research paper based on the supe	ervisor's
feedback.	
August	
 Week 1 The supervisor confirmed our research paper the ICAC conference. 	for submission to
W 12	
 Week 2 Started writing the individual final report. Submitted our research paper to the ICAC co 	onference
Week 3 • Had a team meeting and discussed the PP2 ar	
_	
components.	l l

Week 4	 Met with the supervisor to obtain the signature for the final report. Completed individual final report and submitted to the CDAP. Final report was sent for proofreading.
	September
Week 1	 Had a team meeting and discussed the PP2 Built MATLAB simulation model to calculate temperature variation using metadata and dynamic weather parameters. Started creating the PP2 slides.
Week 2	 Checked that 90% of the HeatScape app is working correctly. Presented the 90% progress to the panel at PP2
Week 3	 Shared the panel comments with the supervisors Demonstrated how the simulation worked to the supervisors Continued some integration work between the frontend and backend.
Week 4	 Started creating the project website. Looked into deployment strategies for the models
	October
Week 1	 Did validation testing around the campus Added PDF report generation with exposure maps and recommendations to web application.
Week 2	 A research paper status mail was received from ICAC. Attending research discussion.
Week 3	 Deployed system to AWS. Prepared final presentation Created UI/UX Demo video Applied to WSA Competition
Week 4	Presented the final presentation

2. Supervisor Meeting Logs

Date	Platform / Location	Remarks
Nov 21, 2024 (Thu)	Microsoft Teams	Initial meeting after topic selection; discussed TAF preparation and upcoming proposal schedule.
Dec 5, 2024 (Thu)	Microsoft Teams	Reviewed draft TAF; supervisor feedback on objectives and feasibility.
Dec 18, 2024 (Wed)	Microsoft Teams	Progress check on proposal drafting; clarified scope of components.

Dec 19, 2024 (Thu)	Microsoft Teams	Finalized TAF submission and confirmed biweekly meetings from
Jan 2, 2025 (Thu)	Microsoft Teams	January. Discussed proposal structure and responsibilities for Charter document.
Jan 9, 2025 (Thu)	6th Floor, Main Building	Signed Charter; supervisor advised improvements for proposal presentation.
Jan 16, 2025 (Thu)	Microsoft Teams	Reviewed draft proposal slides; minor adjustments recommended.
Jan 23, 2025 (Thu)	6th Floor, Main Building	Trial run of proposal presentation; feedback on flow and clarity.
Jan 30, 2025 (Thu)	Microsoft Teams	Proposal preparation review; confirmed submission readiness.
Feb 6, 2025 (Thu)	6th Floor, Main Building	Discussed proposal results; planned system development schedule.
Feb 13, 2025 (Thu)	Microsoft Teams	Discussed Blender integration and metadata mapping for building models.
Feb 20, 2025 (Thu)	6th Floor, Main Building	Demonstrated early Simulink thermal model. Supervisor recommended using thermal resistance and moist air properties.
Feb 27, 2025 (Thu)	Microsoft Teams	Reviewed MATLAB-React communication pipeline concept.
Mar 6, 2025 (Thu)	6th Floor, Main Building	Progress on React 3D viewer. Supervisor requested adding sunlight exposure simulation.
Mar 13, 2025 (Thu)	Microsoft Teams	Discussed initial prototype issues; planned next testing cycle.
Mar 20, 2025 (Thu)	6th Floor, Main Building	Supervisor reviewed exposure results and advised validation tests; improvement feedback.
Mar 27, 2025 (Thu)	Microsoft Teams	Prepared for Progress Presentation 1; checked slide content.
Apr 3, 2025 (Thu)	6th Floor, Main Building	Conducted mock PP1; feedback on presentation structure.
Apr 10, 2025 (Thu)	Microsoft Teams	Discussed PP1 results and suggested improvement areas.
Apr 17, 2025 (Thu)	6th Floor, Main Building	Planned model upgrades for more accurate results.
Apr 24, 2025 (Thu)	Microsoft Teams	Introduced matlab simscape model from external supervisor for thermal simulation.
May 1, 2025 (Thu)	6th Floor, Main Building	Began using MATLAB Simulink with Simscape Thermal to design prototype building thermal model.
May 8, 2025 (Thu)	Microsoft Teams	Reviewed 3D model design.
May 15, 2025 (Thu)	6th Floor, Main Building	Supervisor checked progress of frontend development.
May 22, 2025 (Thu)	Microsoft Teams	Discussed integration of backend model with frontend.
May 29, 2025 (Thu)	6th Floor, Main Building	Finalized csv generation format for simulation.
Jun 5, 2025 (Thu)	Microsoft Teams	Supervisor reviewed backend and simulation model.
Jun 12, 2025 (Thu)	6th Floor, Main Building	Discussed research paper draft and experiment validation.
Jun 19, 2025 (Thu)	Microsoft Teams	Feedback on paper structure and data representation.
Jun 26, 2025 (Thu)	6th Floor, Main Building	Reviewed experiment results; finalized paper content.
Jul 10, 2025 (Thu)	6th Floor, Main Building	Supervisor checked final draft before submission.
Jul 24, 2025 (Thu)	6th Floor, Main Building	Reviewed ICAC submission and progress on final report.
Aug 7, 2025 (Thu)	6th Floor, Main Building	Feedback on final report writing and PP2 preparation.
Aug 21, 2025 (Thu)	6th Floor, Main Building	Reviewed final submission; confirmed proofreading stage.
Aug 21, 2025 (Thu)	Microsoft Teams	Final sync-up before submission; confirmed deadlines.
Sep 4, 2025 (Thu)	Microsoft Teams	Discussed PP2 presentation slides and algorithm demonstration.
Sep 4, 2025 (Thu)	6th Floor, Main Building	Conducted PP2 dry run and gathered feedback.
Sep 18, 2025 (Thu)	Microsoft Teams	Reviewed panel feedback and integration progress.

Oct 16, 2025 (Thu)	Microsoft Teams	Reviewed integrated system. Supervisor suggested adding report generation and user-friendly visualization. Final presentation review; validation testing and WSA submission updates.
--------------------	-----------------	---

3. Meeting Notes

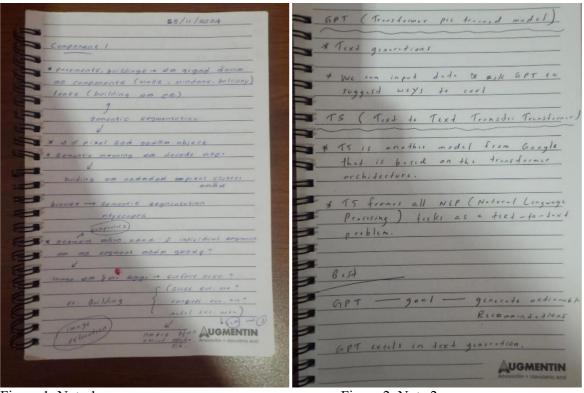


Figure 1: Note 1 Figure 2: Note 2

3/20/2025	The same of the sa
Heat Redining = Heat redaining Area	Genini - 1. 6 - flosh
meterial coverage Total sur. non- x106	instructblip-flen-+5-x1
Vigitation correge = Vigitation Area X 100 Total surface Area	Type 26/06/2025
Aug Temp = E (Temp. of each is just x sur. Ar.)	Concide building
Dog. Homedity = E (Hamidity of each ob. x sur. Am)	trensporend short
Ancent	Gogle - come details. (gillib line) Structure from motion
Heat illend V	Doeth Anything.
A Condity < 45% AUGMENTIN	How to enset deall ing & generate
A . Museum - constant and	doph image

Figure 3: Note 3

Figure 4: Note 4

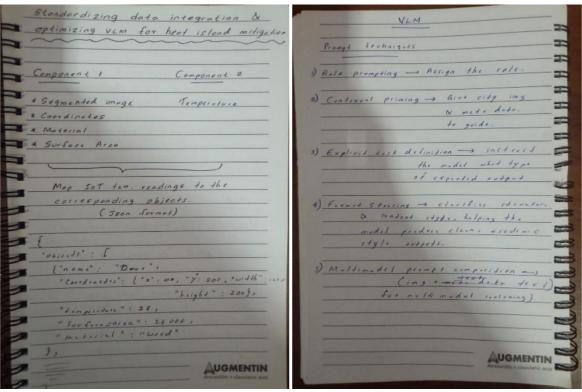


Figure 5: Note 5

Figure 6: Note 6

51:14	5/15/2025
Define heat pattern	Prompt technique. > eddicincy
Medical: concrete, steel absorb & retein heat differently then others (word, glass)	(m.trx)
retein heat differently then	
others (word, glass)	(Charecterists) 1 11/10/10 w/y?
pred 17c survere are	
mace heat.	
5+195	Overleaf - Research pps tool
Pringts	TEEE templede.
(aPT/T5)	Londer a 18 Miscosii -
used for recemendations.	- Mush-delogy
Hugging force - open source	
91 24 43/2	
Transformers -> pythen library for	
fine tone	
Support DERT, GIPT, TS AUGMENTIN	
Parkitedone.	Cianga St. Nata S
are 7: Note 7	Figure 8: Note 8
Viscal & Texual Input preparedion	The last of the Poitte
1 200 200 1 1	
hish resolution	prompt engineer () November
segment was son generated as	VLF
Nat plitlib	
+1x+ -> 1500 812	
a d	* Congerison - why choise this.
VLM Integration	cas we do nix the model
model Bad choose nond Se	
- 1 /2	
Python - Accostorners library	
model on indigition about 000	
environment the sedop wide.	
NEW DU YEAR DONN PROPERTY	
904 DE.	
	2
UGMENTIN Amozociilin + clavularic acid	AUGMENTI

Figure 9: Note 9 Figure 10: Note 10

06/02/2025	Regression Model
Image sticking -> Photos	7
Couth ugraphic & mage sticking)	* Prediction (Yes / No)
	* Supervised learning (labeled data)
combine multiple images.	* 94.25%
3	Random Forest
* Azure digital two	* Works with categorical + numerical date
* Solid works (AD tools	x 92. 80 %.
9 Digital two how recite (free open)	
Crate digita two	Support Vector Machine (SVM)
* how that have store to the st parans,	
* Juraher.com	* Good for binary closes fication (Yes/NM)
	* Best for medium date set.
	± 90.60 Y.
-	K- Nevest Neighbors (KNN)
	P - Western rengancies Carrier
	* Bust for median data set
	* Bust for minion details
	3
THE RESERVE OF THE PARTY OF THE	Allowersen
	AUGMENTIN
	Amoxicilin + diavulanic acid
Figure 11: Note 11	Figure 12: Note 12
Figure 11: Note 11	Figure 12: Note 12
	Figure 12: Note 12
Figure 11: Note 11 3) Output Analysis & V-lid-tion	
	3/27/2025 LLM model> GPT 4.5
check of a VLM 2001 SUSSIE.	3/27/2025
check of a VLM 2001 SUSSIE.	2/27/2025 LLM model → GPT 4.5 Nidel 29 ad Gn, W, WHA? 1.
check over VLM 2001 SUSSE moderial change & a. temperatura veduction piedictions	3/27/2025 LLM model> GPT 4.5
check of a VCM 23 al SUSSIE.	Nidel 2nd anous what.
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd on, U, MARTI. Leptond 20nd 100, DR 20003.
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd on, U, MARTI. Leptond 20nd 100, DR 20003.
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	Nidel 2nd anous what.
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd 0n, U, MANTI. Leptond 20nd 100, Den 2003;
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd 0n, U, MANTI. Leptond 20nd 100, Den 2003;
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd on, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd on, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd On, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd On, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd 0n, U, MANTI. Leptond 20nd 100, Den 2003;
chick whom vem 2001 sussit. There is a sussit. The decision predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd On, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd 0n, U, MANTI. Leptond 20nd 100, Den 2003;
chiele over vem 2001 sussit. moderial change son temperature reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29nd On, U, MARTI. Leptond 20nd 100, Den 20003.
chiele over VLM 2001 SUSSE moderial change & a. temperatura reduction predictions	2/27/2025 LLM model → GPT 4.5 Nodel 29 and 0 an, U, what. Lefter d 20 and 100, 20 and 20.

Figure 13: Note 13

Figure 14: Note 14

Ex: Building	Dingge Son formative
	@ language partel sound nood odda
[DO] building and mudifications oban	. DE output od on Sind and on.
DI so not conson doy about good	3 de trade
Soes Do so revels sed	do experimends - result
2	improvement
predict - building od culor charge.	prompt on sons while
Dhuilding glass replace.	9,000 7
building and ares an and	model no retrien abox
65 864 DO SO Levels DEN Solution	para in alla goods
ogn en (outpot)	20000
	Prompt ingracions
VIMILLAND and force nice of one	
Dr stenderd formet sond.	
	model on two abos - Actual suggetions and
nosa peragraph ond oded nigo	ger model on bear apro.
VLM follow alnow Note prompt	Keywoods Ter of time gree out do
on 34000 of format 2000 overt	
20 61KM 9500	medil and retreen only 100 thousend
	5 cm p (1).
output - Standard formet se	
	Sir odn divers about a output forant.
Essumption code 20% x	
versity "10 2 oin sygether	
	AUGMENTIN
(omfored 9) AUGMENTIN Amosicillin + clavulanic acid	Amoxicilin + clavirianic acid

Figure 15: Note 15

Component 3

* Arishr. + Sichinkine

photo + discription (article I. Are, temp)

Studend formet servin of oc data 500

(image - resolution pinnons appo data

Don read about a post server, image

extra 3000 text, image

LLM - model 300 spain apport text, image

(ROB photo - original), segmentation

about map so text spain apport text, image

(ROB photo - original), segmentation

about map so text spain apport

Sind apport

Sind apport

Oinformation so formet sood not not a

into simple with sind sood not one

stantistion so formet soud not so of the

Sould soud appoint so of sound so of the

Sould sound so sould so of the

Sould sound so sould so of the

Stantistion of sound sould so of the

Sould sound so sould so of the sound sould so of the sound sould sou

Figure 16: Note 16

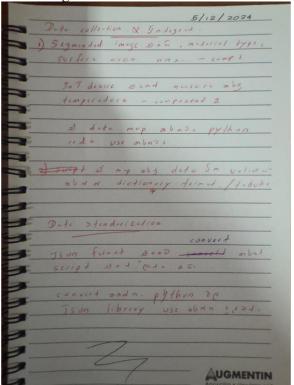


Figure 17: Note 17

Figure 18: Note 18

Component 2	Dimege segmentation (existing model have)
timp.	@ individual segment of to industify materials
* 96 objects individually identify \$6000	5
(predictions)	
- (Predictions)	1 meterial ap surface area on calculate ability
	(thund property - db sold on your)
* device on more abor temperature record	
ab ada + 300-n f ineges baba	
nerrow down shoops	moin - image soon full decription w
	job extract 860.
Just of discription son naganio soco 60000101	
osings timp. Sind record of	
naced '	
	<u> </u>
* xyz 360° derice. (Robo orm)	
	65
* IR thermometer -> leser -> aim obes -> target	
* Device - Abtometion Bend oben measurements	
766nm gene surface end time. 766nn	
Josep map ode neno. (vishen sir)	
Bud map but names. (Vishen sir)	
* segment -> output so good grip signed	
op temp.	No.
(viction sir)	
2.10.12.	
	*
AUGMENTIN	
AUGMENTIN	
Amountilla 4 signification	
Arroxicillin + clavulanic acid	AUGMENTIN
Amoxiciliin + clanulanic scid	AUGMENTIN
Amoxiciliin + clanulanic scid	Amoxidiin a story
Figure 19: Note 19	Figure 20: Note 20
Figure 19: Note 19	Figure 20: Note 20
Figure 19: Note 19	Figure 20: Note 20 Planet ad fine tone about 38 plant on mill 35 8000 85 information
Figure 19: Note 19 Sealable template and Soud n BG and Good n BG and Go	Figure 20: Note 20 Planet ad fine tone about 38 plant on mill 35 8000 85 information
Figure 19: Note 19 Sealable templete and Sandan BE and Georg image and I don't bimage and elevely LLM and GEN 2004 5/172	Figure 20: Note 20 Planet od fine tone obod 28 prond en nido 26 acro 25 information 80 85 format and output abo
Figure 19: Note 19 Sealable template and Soud n BG and Good n BG and Go	Figure 20: Note 20 prompt and fine tone about and promote and fine tone about and promotion so an format and output about and appear appear and appear and appear and appear and appear appear and appear and appear appear and appear and appear and appear appe
Figure 19: Note 19 Sealable template and Sandan BG and Sealable template and Sandan BG and Sealable template and Sandan BG and Clearly tem and Gpt a good Sind (Gpt your Sin image + tent)	Figure 20: Note 20 Planet od fine tone obod 28 prond en nido 26 acro 25 information 80 85 format and output abo
Figure 19: Note 19 Sealeble templete and Sand n 35 and Serg inege and stand & inege and stand Clearly cem and stand & inege and stand Column your stand inege + tend	Figure 20: Note 20 Planet and fine tone about and promotion So so formet and output about Signal Or Danson model and train about a
Figure 19: Note 19 Sealeble templete and Sound BE and Gara inege and gland & inege and Sina electly cem and sent again \$ inege and Sina (agan good sign inege + tend) Phython Sina Sound date seve alada 900000 acree \$ \$5600 library (dedinaries)	Figure 20: Note 20 Planet and fine tone about and promotion So so formet and output about Signal Or Danson model and train about a
Figure 19: Note 19 Seafeble templete and Sound BE and Gerg inege and gland direct and Sign Clearly LEM and Ept a good Sign Column good Sign image + tend) Phython Sign desert date sever about a grad a crays Sign library (dechioreries)	Figure 20: Note 20 Planet and fine tone about and promotion So of formet and output about Signal Or Danson model and train about and (existing apolicy and its print and
Figure 19: Note 19 Seafeble templete and Sound BE and Gerg inege and gland direct and Sign Clearly LEM and Ept a good Sign Column good Sign image + tend) Phython Sign desert date sever about a grad a crays Sign library (dechioreries)	Figure 20: Note 20 prompt and fine two entrat and promote on might and account and output about and or fine model and train about and (existing appropriate and its promote and contains a
Figure 19: Note 19 Sealable template and Bood on Bo and Gara image and stand b image not a clearly LLM and Girl a good bign Color good bign image + tend) Phython 5ind Bood date save about a grown arrays 5ind library (dictionsis) yearlotte Sould date add	Figure 20: Note 20 Planet and fine tone about all pront on might as above as information so as formet and output about Sina or parana model and train about (existing about and in and in and
Figure 19: Note 19 Seeleble templete and Bondon Bo and George image and stand b image and clearly LLM and Gent good bins Colon good bin image + tend) Potthon sind acre date see about a grand acre ye sind library (declinaries) gentable son good	Figure 20: Note 20 prompt and fine two entrat and promote on might and account and output about and or fine model and train about and (existing appropriate and its promote and contains a
Figure 19: Note 19 Seepleble templete and Bound Bo and Gorg image and gland b image and clearly LLM and Gord again 5 in Colon your sin image + tend) Phython sind bound date seve oberts grown arrays sind library (declinations) gentlable so not date add gent fields add a 141	Figure 20: Note 20 prompt and fine two entrat and promote on might and account and output about and or fine model and train about and (existing appropriate and its promote and contains a
Figure 19: Note 19 Sealable template and Sauten 36 and correction of the seal	Figure 20: Note 20 prompt and fine tone when as promot on when as acro so information so so format and output abor signal or particle and train about and (existing model and it promot and (comp) upp, so information and not it and
Figure 19: Note 19 Seeleble templete and Bondon Bo and Gero image and grand b image and clearly LLM and often good sign Color good sign image + tend) Phython sign acrays sign image + tend grown acrays sign library (declinaries) gentland add grown gentland add grown	Figure 20: Note 20 prompt and fine tone about and promote and fine tone about and promotion so and format and output about signal or and model and train about and (comp) mile, so information and promote and promote and are and are
Figure 19: Note 19 Sealable template and Sauten 36 and correction of the seal	Figure 20: Note 20 prompt and fine tone when as promot on again as acro as information so as format and output abor signal or posterior model and train abords (existing anodel and its promot and (ima) upp, so information and not good? Prompt -> consider and or an abord on agan prompt on fine
Figure 19: Note 19 Seeleble templete and Bouden Bo and Gero image and grand b image and electly LLM and Gert good biggs Color your bign image + tend) Phython bign bound date sever oberts good acrege bign library (declinations) gent acrege bign library (declinations) gent fields and a side good agent fields and a side good agent fields and a side good	Figure 20: Note 20 prompt and fine tone about and promote and fine tone about and promotion so and format and output about signal or and model and train about and (comp) mile, so information and promote and promote and are and are
Figure 19: Note 19 Seeple ble templete and Boudon Bo and Gero image and gland b image and electly LLM and offer good biggs Colon your bign image + tend) Phython bign bound date seve oberda good acrays bign library (declination)	Figure 20: Note 20 prompt and fine tone when as promot on again as acro as information so as format and output abor signal or posterior model and train abords (existing anodel and its promot and (ima) upp, so information and not good? Prompt -> consider and or an abord on agan prompt on fine
Figure 19: Note 19 Seeleble templete and Bouden Bo and Gero image and grand b image and electly LLM and Gert good biggs Color your bign image + tend) Phython bign bound date sever oberts good acrege bign library (declinations) gent acrege bign library (declinations) gent fields and a side good agent fields and a side good agent fields and a side good	Figure 20: Note 20 prompt and fine tone when as promote an again as acro as information so as formet and output about sind of some and control and grand and control and grand and company consider and grand and spend and spen
Figure 19: Note 19 Seeple ble templete and Bouden Bo and Gero image and gland b image and electly LLM and offer good biggs Color your bign image + tend) Phython bign bound date seve oberen good acrays bign library (declination)	Figure 20: Note 20 prompt and fine tone about and promote and sine tone about and promote and sine and and sine and control and train about and control and train about and control and train about and control and sine and control and sine about and sine about and and sine about and about and sine about a
Figure 19: Note 19 Seepleble templete and Sound BB and Gerg imege and grand Singe Bod clearly LLM and GENN good Sing (GIAN GOT Sin image + tend) Phython Sin Sound date seve about grown arrays Sino library (dectionaries) gentials: Sound add add gent fields add and good date size field age **Communication standard and date temport Standard. (Litores)	Figure 20: Note 20 prompt and fine tone what so promet on what so acro so information Son so format and output about sone Sind Or Defend Market and train about and (existing and and train about and (comp) Die to information and of son about from about and prompt and fine tone about about son the fine tone about about sone as a sone on sind and about sone and about and about a
Figure 19: Note 19 Seepleble templete and Sound 55 500 decreo image and gland simoge and simoge and clearly cem and offen good simoge and simoge allowed simoge and simoge allowed simoge and simoge allowed simoge and simoge allowed and arrange simogen determined seemed and and an appear and simogen arrange simogen determined and simogen and	Figure 20: Note 20 prompt and fine tone about and promote and sine tone about and promote and sine and and sine and control and train about and control and train about and control and train about and control and sine and control and sine about and sine about and and sine about and about and sine about a
Figure 19: Note 19 Seeple ble templete and Sound 55 500 decents in some sound	Figure 20: Note 20 prompt and fine tone what so promet on what so acro so information Son so format and output about sone Sind Or Defend Market and train about and (existing and and train about and (comp) Die to information and of son about from about and prompt and fine tone about about son the fine tone about about sone as a sone on sind and about sone and about and about a
Figure 19: Note 19 Seepleble templete and Sound 55 500 decreo image and gland simoge and simoge and clearly cem and offen good simoge and simoge allowed simoge and simoge allowed simoge and simoge allowed simoge and simoge allowed and arrange simogen determined seemed and and an appear and simogen arrange simogen determined and simogen and	Figure 20: Note 20 prompt and fine tone whom so promet on what so so so information so so fromet and output about sons sons fromet and output about sons (existing and it sond promet and (existing and it sond promet and (existing and it sond promet and (existing and it sond sons sons and (existing and it sond sons sons and and sons sons sons sons sons sons sons so
Figure 19: Note 19 Seeple ble templete and Sound 55 500 decents in some sound	Figure 20: Note 20 prompt and fine tone what so promot on with so so so so information So so format and output about single consider and grand promot and consider so and grand? Prompt aconsider so and so
Figure 19: Note 19 Sealable template and Sauta BG and open integer and yand & image and clearly tem and Eph a good & integer and clearly tem and Eph a good & integer and	Figure 20: Note 20 prompt and fine tone whom so promet on what so so so information so so fromet and output about sons sons fromet and output about sons (existing and it sond promet and (existing and it sond promet and (existing and it sond promet and (existing and it sond sons sons and (existing and it sond sons sons and and sons sons sons sons sons sons sons so
Figure 19: Note 19 Seeple ble templete and Sound 55 500 decents in some sound	Figure 20: Note 20 prompt and fine tone what so promot on with so so so so information So so format and output about single consider and grand promot and consider so and grand? Prompt aconsider so and so
Figure 19: Note 19 Sealable template and Saute BG and open integer and yand & image and clearly tem and Gpt a good & integer and clearly tem and Gpt a good & integer and	Figure 20: Note 20 prompt and fine tone what so promot on with so so so so information So so format and output about single consider and grand promot and consider so and grand? Prompt aconsider so and so
Figure 19: Note 19 Sealable template and Sauta BG and open integer and yand & image and clearly tem and Eph a good & integer and clearly tem and Eph a good & integer and	Figure 20: Note 20 prompt and fine tone what so promot on with so so so so information So so format and output about single consider and grand promot and consider so and grand? Prompt aconsider so and so
Figure 19: Note 19 Sealable template and Saute BG and open integer and yand & image and clearly tem and Gpt a good & integer and clearly tem and Gpt a good & integer and	Figure 20: Note 20 prompt and fine tone what so promot on with so so so so information So so format and output about single consider and grand promot and consider so and grand? Prompt aconsider so and so

Figure 21: Note 21 Figure 22: Note 22

AUGMENTIN

Date No.	Date No.
* to get GIS Data	-Simulation-
I we use OSM Copen sheet Map)	
129 Download GIS Data cuth senantics wing	A) Preparation
neo fobric) Digital twin Model Metadata (000)
· North america 16.4 GB) Grevenmontal data I (qualight X, ambart temp, and)
	B) Mallah & Smulink sthup.
	* * Mottob Online Busic ladas full sinsape Support *
* Mattab cooline (Busic)	* If limited to caline, 2 can deapt most roots but not
	advanced thermal blocks visually of
1+ Singcape Thermal Computation Singcape, (metrobox) only available on	11-> Add Simscope -> foundation -> thermal -> thormal
	other ought other all Mass
derk top)	orders for convective heat transfer
. allows physical smouthful of heat transfer sutten	recolution . Heat Source.
wing real-would compenents	- radiation Temperator Sensor
and contract	And sumented & influences
See han c	Delign the simulat Model
- 1 1 dian modelin	· Use thermal Mans block for such region (input final)
or a hout the mal competition	from density x volume, speculic heat)
1 -dood thormas Imale	· Add hat flow source
I make the property of the pro	O = (90101 - absurptione) x (2unligh enogu)x complete
a with HILAC start occell, and retired	. Add temperature sensor
Gay are of emblent weathe sopris /V/round the	output the result par region
	- case from everlespace or Mallab Anction block.
	road you as v to inject proporties and initial temp
	gualate time
	Costiger solver configuration to simulate from 6-6
	am pm 97
Figure 23: Note 23	Figure 24: Note 24
	1.12 -4.03 × 2100 Costs
D) Automote the pipeline	Well but 2 -4.03 Well but 3 -34.44 grentoute grandoused
· Read CSV	-41
-load into Simuliale model willing set person or	
Simulial Simulation Dapot	Grunan temp
- Run Simulation Rom Grat	the middle wood
Simput - Sin ("gar mode")	on terral proteher.

Deliverate the pipeline

Read CSV

Need into Simulate medel uting set puram or

Simulate Simulate medel uting set puram or

Simulate Simulate made!

Run Simulation from Supet

Simulate Simulation from Supet

Simulate Simulation from Supet

Simulate Simulation from Supet

Contract Least the structure of the set of the

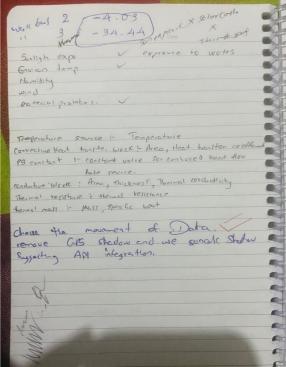


Figure 25: Note 25

Figure 26: Note 26

4. Git Activity History

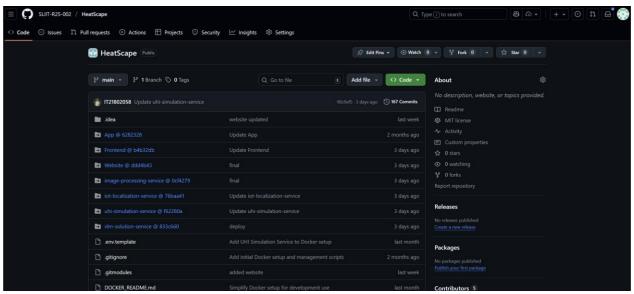


Figure 27: Git Repo

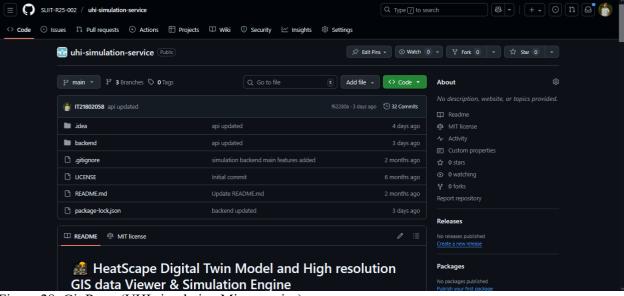


Figure 28: Git Repo (UHI simulation Microservice)

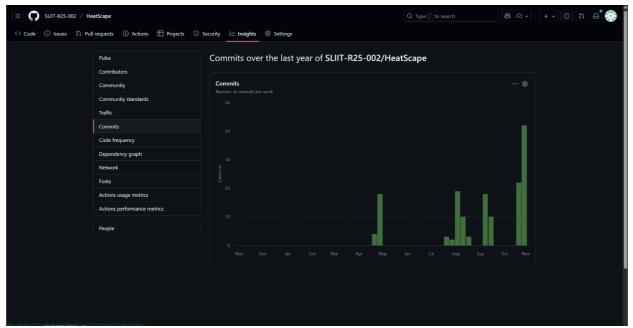


Figure 29: Git Code Commits (Main Repo)

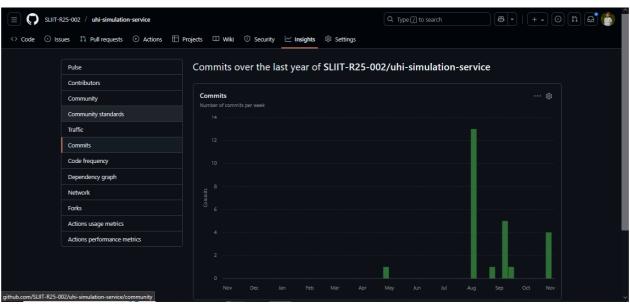


Figure 30: Git Code Commits (UHI simulation Microservice)

5. Screenshots of Meetings & Mails

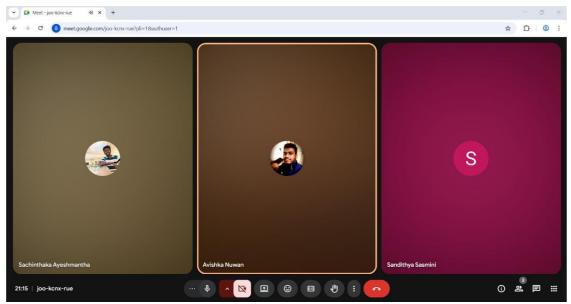


Figure 31: Group Meeting

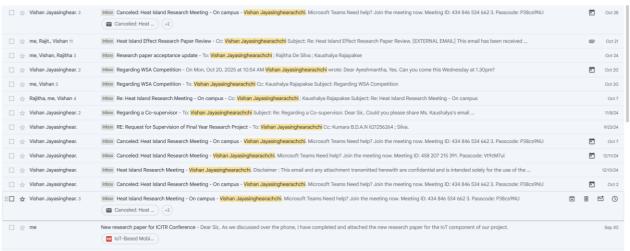


Figure 32: Emails 1



Figure 33: Emails 2

🗌 🕁 Vishan Jayasinghear. 4	Reconfirmation of Research Project Supervisor - From: Ayeshmantha S.K.S. it21219320 Sent: Friday, September 27, 2024 9-46 PM To: Vishan Jayasinghearachchi Subject: Confirmation of Research Project	0	10/16/24
🗌 🕁 Vishan Jayasinghear.	Floor: Tentative: Research Paper Review #2 - Disclaimer : This email and any attachment transmitted herewith are confidential and is intended solely for the use of the individual or entity to		Jul 29
☐ ☆ Vishan Jayasinghear. 2	Inbox: Heat Island Research Meeting - Vishan Jayasinghearachch. Microsoft Teams Need help? Join the meeting now. Meeting ID: 458 207 215 391. Passcode: Vt9zMTui		Apr 11
🖂 🛕 me, Rajitha 5	Inbox: Research paper review - To: Rajitha De Silva ; Vishan Jayasinghearachchi Subject: Research paper review		Aug 19
🗌 🏠 Vishan Jayasinghear.	Inbox: Canceled: Heat Island Research Meeting - On campus - Canceling due to the May day holiday. Disclaimer: This email and any attachment transmitted herewith are confidential and is intended solely for the	Ō	Apr 30
🗌 🕁 Vishan Jayasinghear.	Inbox Heat Island Research Meeting - On campus - Dear all, Moving the meeting to 2pm as requested. Microsoft Teams Need help? Join the meeting now. Meeting ID: 484 102 012 728. Passcode: we6uU9rz	$\overline{\Box}$	May 28
☐ ☆ Vishan Jayasinghear.	Inbox Heat Island Research Meeting - On campus - Dear all, Dr. Rajitha will join with our regular meeting online. I still prefer if the team members come for the meeting on campus.	•	Apr 11
🗌 🛕 Vishan Jayasinghear. 3	Inbox RP meeting - From: Ayeshmantha S.K.S it21219320 Sent: Wednesday, November 6, 2024 3:59 PM To: Vishan Jayasinghearachchi Subject: Re: RP meeting Dear Sir,	0	11/6/24
🔲 🕁 Vishan Jayasinghear. 2	Inbox: Canceled: Heat Island Research Meeting - Vishan Jayasinghearachchi. Microsoft Teams Need help? Join the meeting now. Meeting ID: 458 207 215 391. Passcode: Vt9zM7ui		Apr 11
☐ ☆ Vishan Jayasinghear.	Inbox: Heat Island Research Meeting - Best regards, Vishan Jayasinghearachchi. Microsoft Teams Need help? Join the meeting now Meeting ID: 458 207 215 391 Passcode: Vt9zMTui	Ō	11/27/24
🗌 🕁 Vishan Jayasinghear.	Inbox: Heat Island Research Meeting - Best regards, Vishan Jayasinghearachchi. Microsoft Teams Need help? Join the meeting now Meeting ID: 458 207 215 391 Passcode: Vt9zMTui		11/28/24
☐ ☆ Vishan Jayasinghear.	Inbox Re: Update on project proposal presentation - From: Ayeshmantha S.K.S it21219320 Sent: Tuesday, January 28, 2025 11:14 AM To: Vishan Jayasinghearachchi Subject: Update on project proposal	0	Jan 29
🗌 🕁 Vishan Jayasinghear.	Inbox Canceled: Heat Island Research Meeting - On campus - Dear all, Cancelling due to Poya holiday. Microsoft Teams Need help? Join the meeting now. Meeting ID: 484 102 012 728. Passcode: we6uU9rz	€	Jul 8
🔲 🕁 Vishan Jayasinghear.	Heat Island Research Meeting - On campus - Disclaimer: This email and any attachment transmitted herewith are confidential and is intended solely for the use of the individual or entity to		Mar 20
🗌 🕁 Vishan Jayasinghear.	Inbox: Heat Island Research Meeting - Dear all, The meeting discuss the heat island research work as discussed. Best regards. Vishan Jayasinghearachchi. Microsoft Teams Need help?		11/18/24
🗌 🏠 Vishan Jayasinghear.	Inbox Heat Island Research Meeting - Vishan Jayasinghearachchi. Microsoft Teams Need help? Join the meeting now. Meeting ID: 458 207 215 391. Passcode: VI9zMTui	$\overline{\Box}$	11/21/24
🗌 🕁 Vishan Jayasinghear.	Inbox Canceled: Heat Island Research Meeting - On campus - Cancelling due to the examinations. Microsoft Teams Need help? Join the meeting now. Meeting ID: 484 102 D12 728. Passcode: we6uU9rz	$\overline{\bullet}$	May 29
☐ ☆ Vishan Jayasinghear.	Inbox: Heat Island Research Meeting - Vishan Jayasinghearachchi. Microsoft Teams Need help? Join the meeting now. Meeting ID: 458 207 215 391. Passcode: VI9zM7ui	$\overline{\bullet}$	Jan 3
🗌 🕁 Vishan Jayasinghear.	linbox Heat Island Research Meeting - On campus - Vishan Jayasinghearachchi. Disclaimer : This email and any attachment transmitted herewith are confidential and is intended solely for the use of the		Jan 3
🗆 🕁 Vishan Jayasinghear.	Inbox Re: Inquiry about meeting tomorrow - From: Ayeshmantha S.K.S it21219320 Sent: Wednesday, April 2, 2025 4:37 PM To: Vishan Jayasinghearachchi Cc: Kaushalya Rajapakse Subject: Inquiry about	0	Apr 3

Figure 34: Emails 3

☐ ☆ Vishan Jayasinghear.	Inbox: RE: Reminder - Imagine Cup & Author List - vishan Jestintik Subject: Reminder - Imagine Cup & Author List Hi Vishan Sir, Just a quick reminder from our last		Aug 11
☐ ☆ Rajitha, me 8	Inboic Re: Clarification on Daily Research Paper Discussion Sessions - vishan, @slitt.lk-; Kaushalya Rajapakse Subject: Re: Clarification on Daily Research		Jul 23
☐ ☆ Vishan Jayasinghear.	Index: Article on creating digital twins - Dear Ayeshmantha, Dhanushikan, This article provides a good overview of the process of developing a		Jul 14
☐ ☆ it21802058 Madhuwan.	Inbox: Fwd: Clarification on Simulation Scope Regarding GIS Metadata Integration - vishan, @stirt.lk> Dear Dr. Rajitha and Mr. Vishan, I hope this message finds you well. I'm writing to clarify an		Jul 6
☐ ☆ Rajitha De Silva 2	Inbox Re: HeatScape Research Paper - vishanj@sliit.lio; Kaushalya Rajapakse Subject: Re: HeatScape Research Paper		Jun 30
☐ ☆ Vishan Jayasinghear.	Inbox: RE: Draft Research Paper - HeatScape - vishan,j@slit.lk- Cc: Kaushalya Rajapakse Subject: Draft Research Paper - HeatScape		Jun 20
☐ ☆ Vishan, me 4	Inbox: RE: Quick Clarification on Research Paper Scope - vishan_j@slitt.lk- wrote: > Dear Ayeshmantha, > > I'm ok, can you kindly check with Dr. Rajitha? If so		May 27
☐ ☆ Vishan Jayasinghear.	Inbox: Canceled: Heat Island Research Meeting - On campus - Cancelling due to new year holidays.		Apr 11
☐ ☆ Vishan Jayasinghear.	Index. Canceled: Heat Island Research Meeting - On campus - Disclaimer: This email and any attachment transmitted herewith are confidential and is intended		Apr 3
☐ ☆ Vishan Jayasinghear. 2	Inbox RE: Heat Island Research Meeting - On campus - vishan j@sliit.k-; Kumara BDAN it21256264; Silva.GMSS it21802126 <it21802126 <it21802126<="" td=""><td></td><td>Mar 10</td></it21802126>		Mar 10
☐ ☆ Vishan Jayasinghear.	Inbox: Canceled: Heat Island Research Meeting - On campus - Dear all, I will be on leave tomorrow. Instead, I can give you time on Tuesday (11th March) around		Mar 5
☐ ☆ Vishan Jayasinghear.	Inbox Canceled: Heat Island Research Meeting - On campus - Disclaimer: This email and any attachment transmitted herewith are confidential and is intended		Feb 20
☐ ☆ Vishan Jayasinghear.	Inbox Heat Island Research Meeting - On campus - Time updated as discussed. Disclaimer: This email and any attachment transmitted herewith are		Jan 21
☐ ☆ Vishan Jayasinghear.	Inbox RE: Regarding the charter document - vishan.j@slirt.lk> Ct: Kaushalya Rajapakse Subject: Regarding the charter document		Jan 6
☐ ☆ Vishan Jayasinghear.	Inbox Heat Island Research Meeting - On campus - Disclaimer : This email and any attachment transmitted herewith are confidential and is intended		Jan 3
☐ ☆ Vishan Jayasinghear. 2	Inbox Re: Checking Availability on the 18th - https://www.epa.gov/heatislands/learn-about-heat-islands Best regards, Vishan Jayasinghearachchi From	•	11/18/24

Figure 35: Emails 4

6. Gallery







Figure 36: Validation Testing 1

Figure 37: Validation Testing 2

Figure 38: Validation Testing 3



Figure 39: Final Presentation Completed