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FACULTY OF ENGINEERING AND ARCHITECTURE

ELECTRONICS AND INFORMATION SYSTEMS DEPARTMENT
IDLAB – INTERNET TECHNOLOGY AND DATA SCIENCE LAB

3D MESH CODING WITH PREDEFINED REGION-OF-INTEREST

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OVERVIEW

- ❑ Introduction: Wavelet-based Mesh Coding
- ❑ Predefined Regions-of-Interest
- ❑ ROI-Aware Inverse Wavelet Transform
- ❑ Evaluation
- ❑ Conclusions

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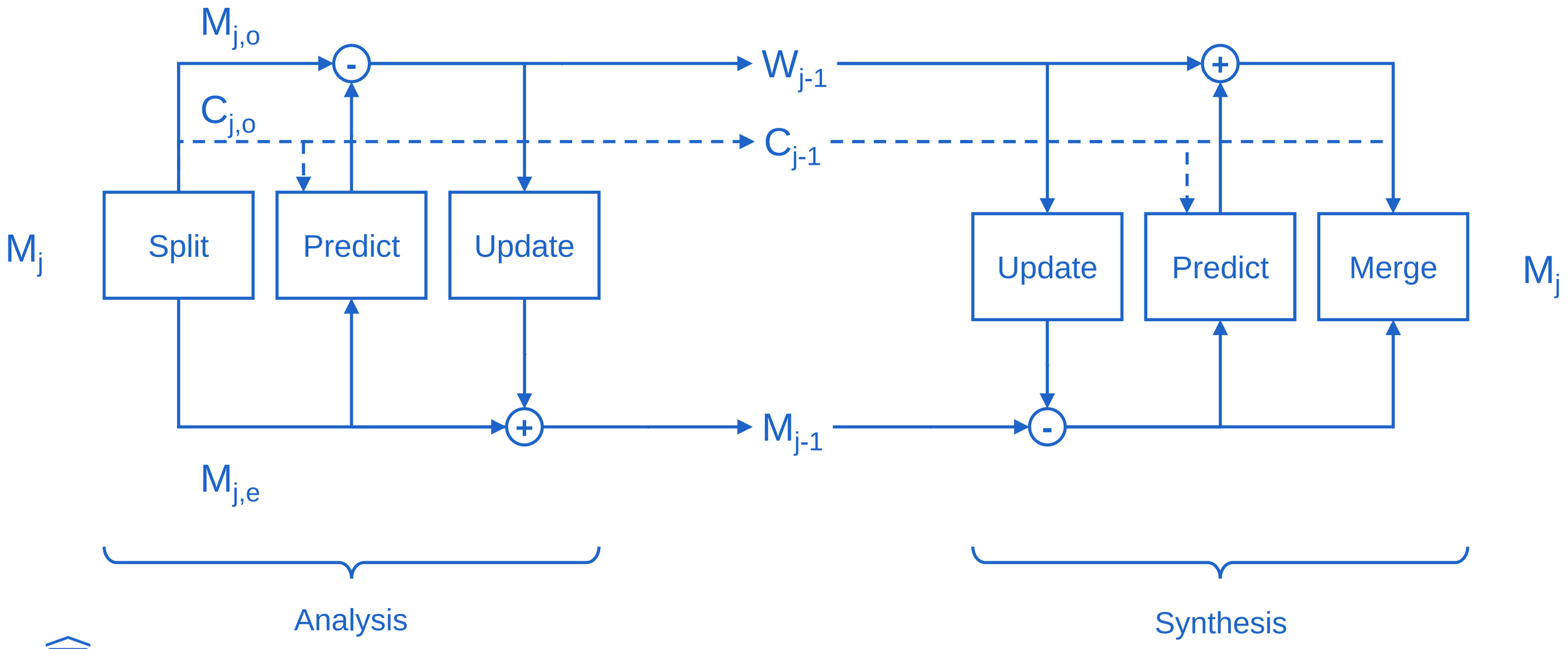
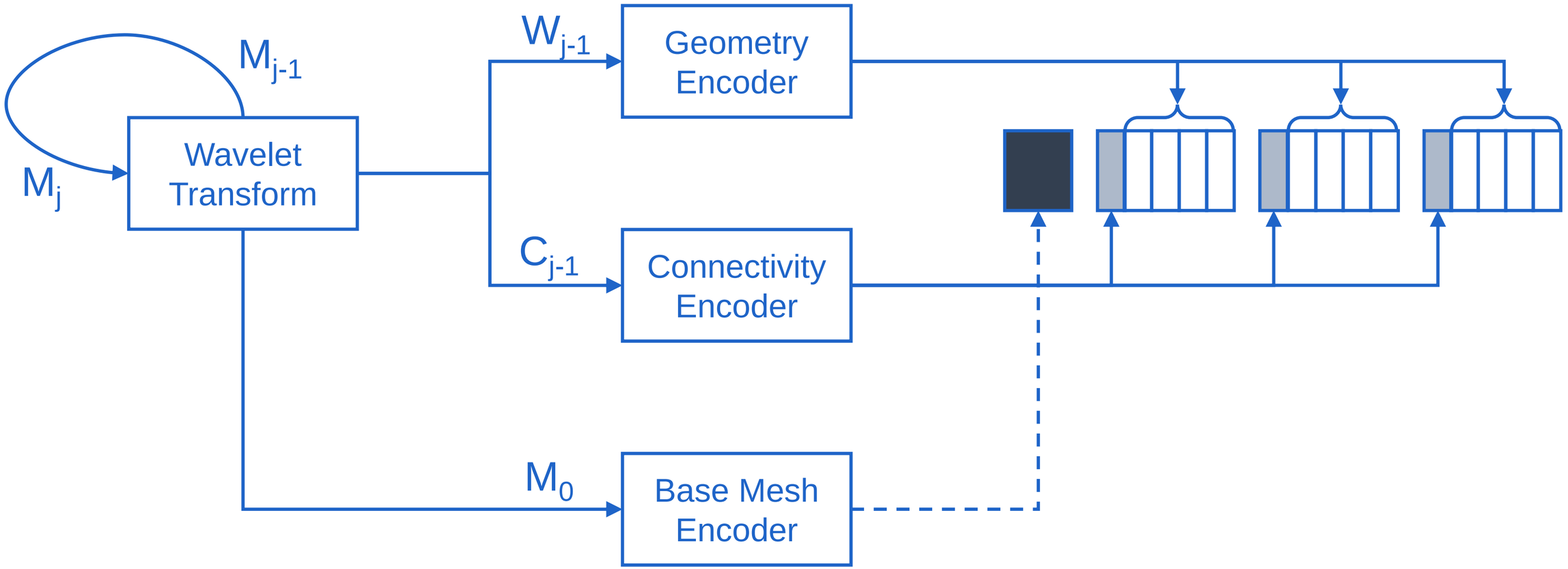
WAVELET-BASED MESH CODING

THE WAVELET TRANSFORM



ENCODING OF THE WAVELET SUBBANDS



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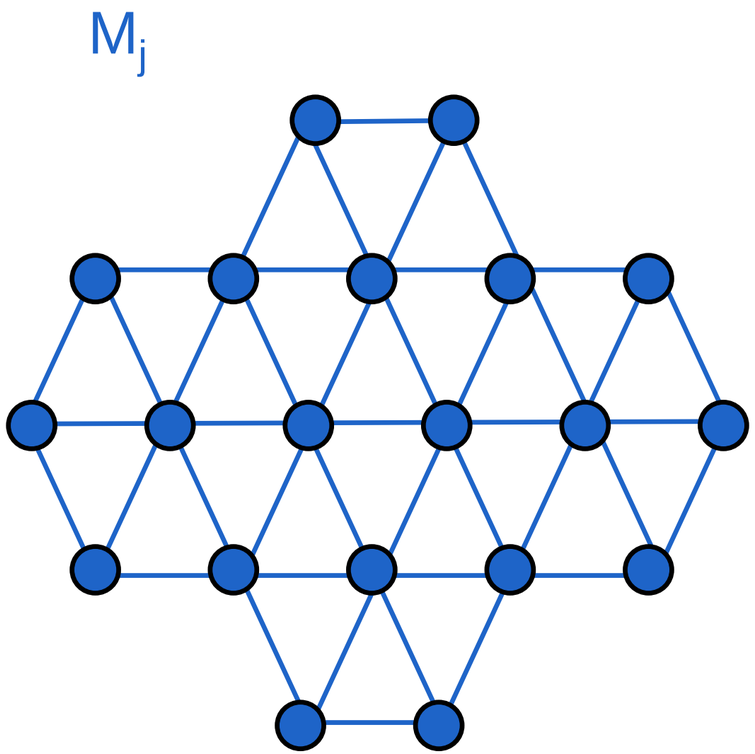
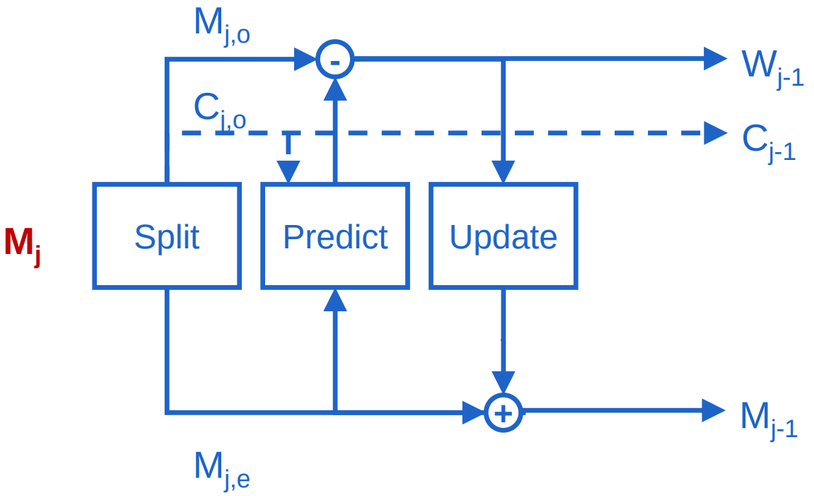
PREDEFINED REGION-OF-INTEREST

PROPAGATING AN ROI MASK





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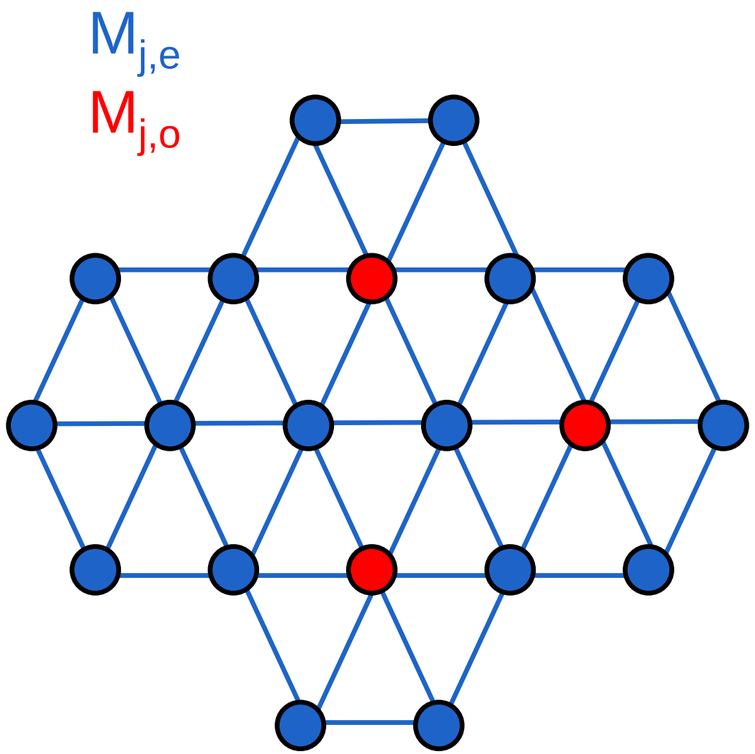

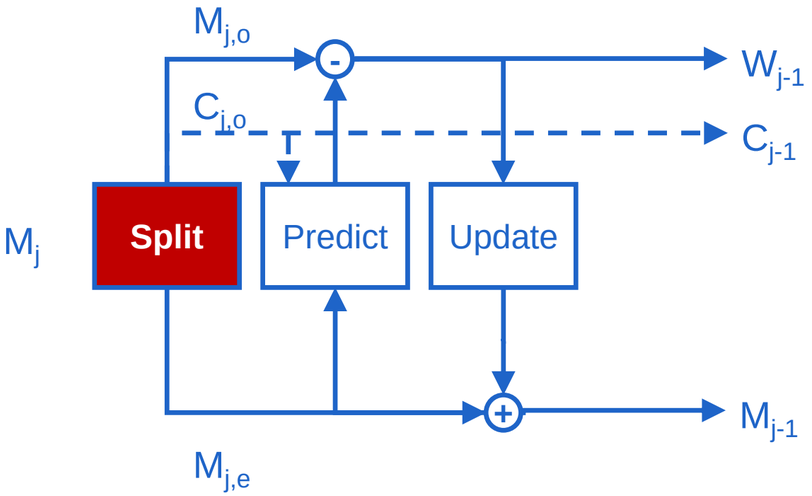

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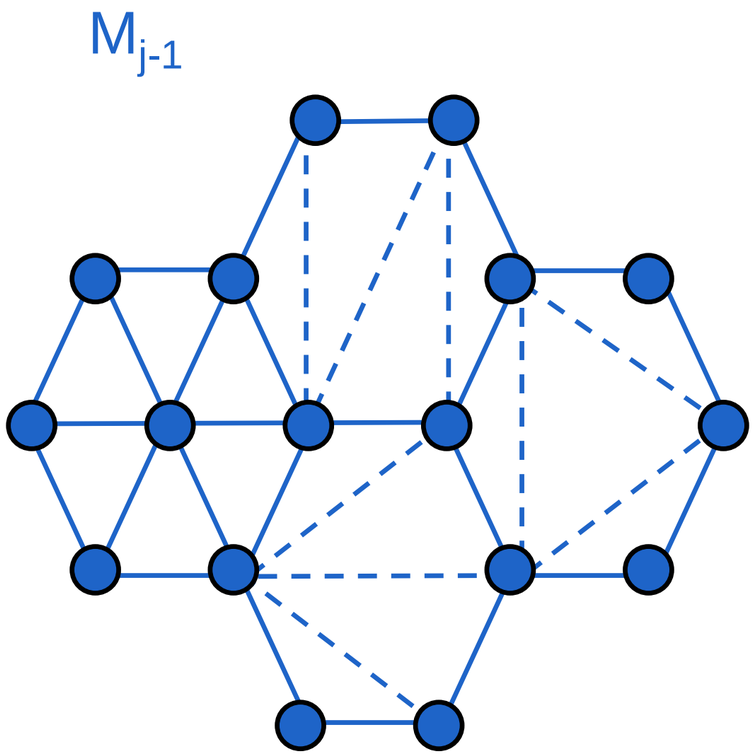

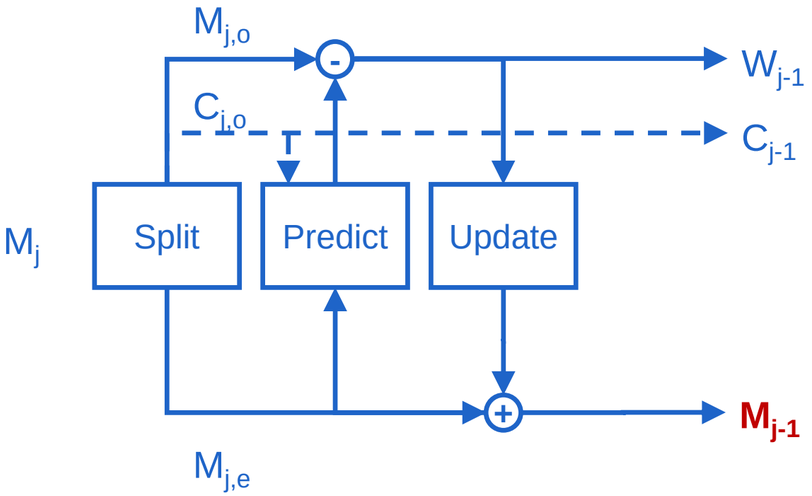

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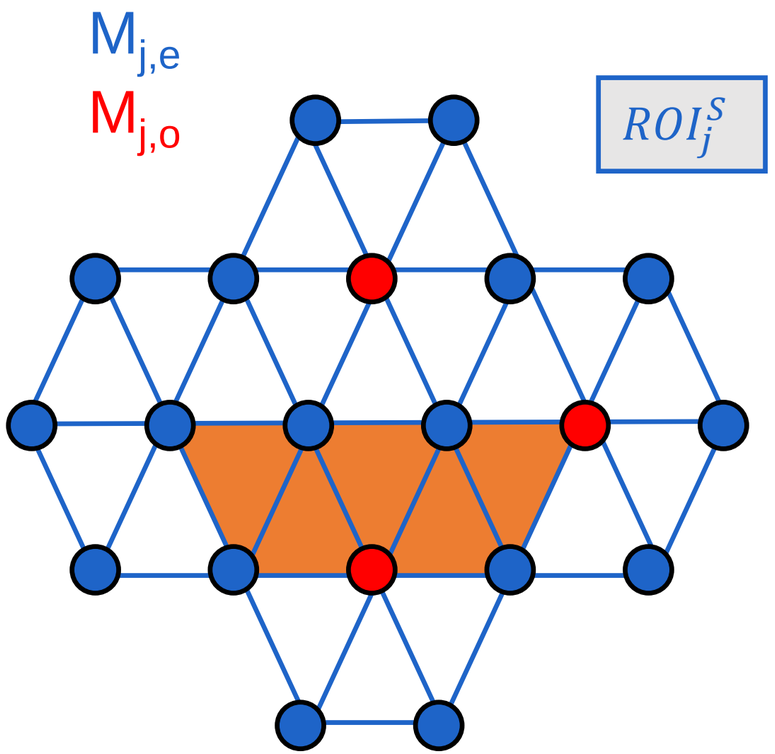

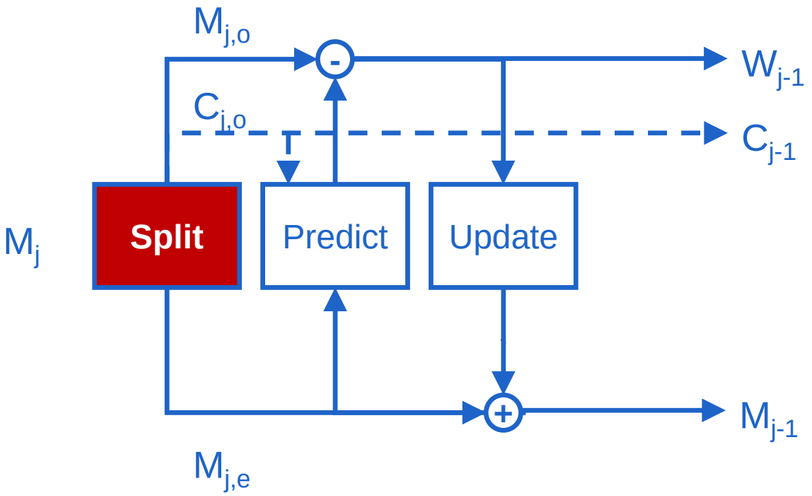

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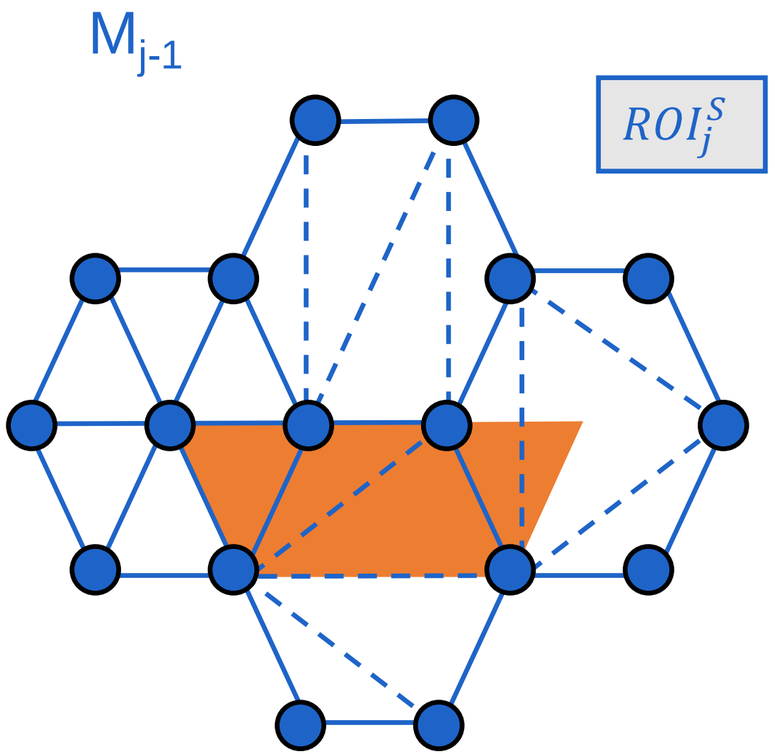

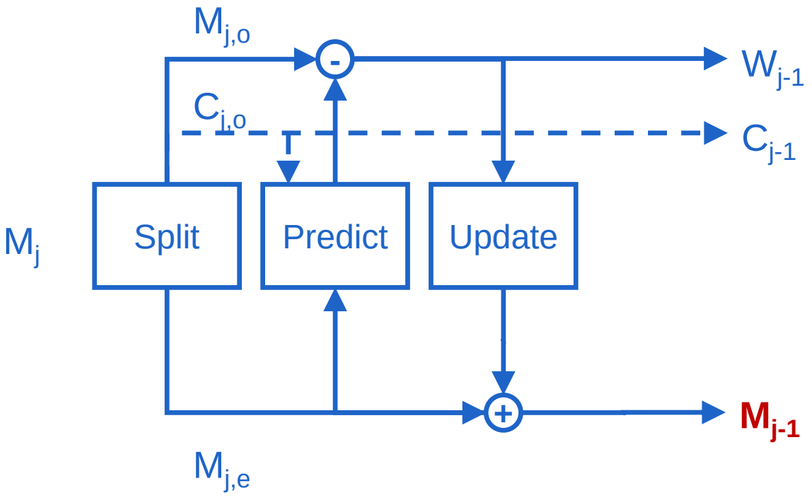

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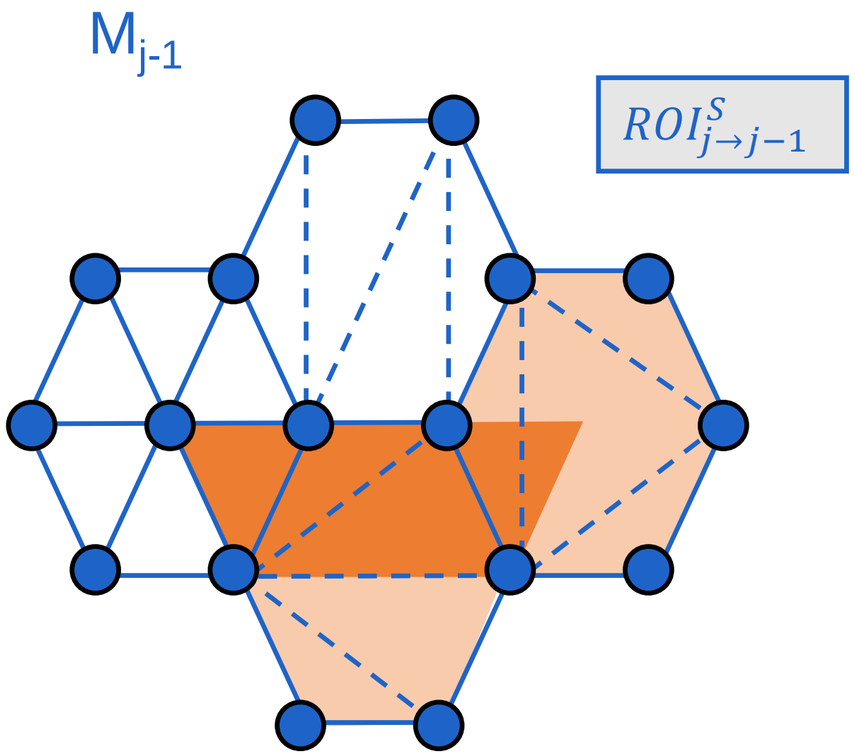

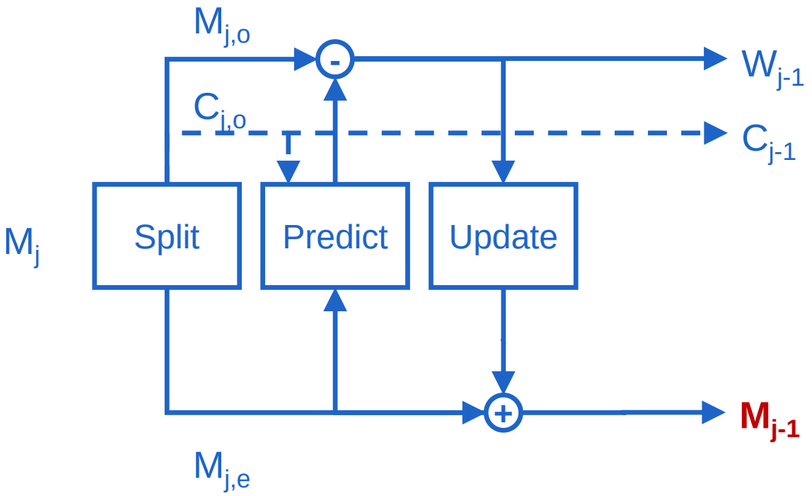

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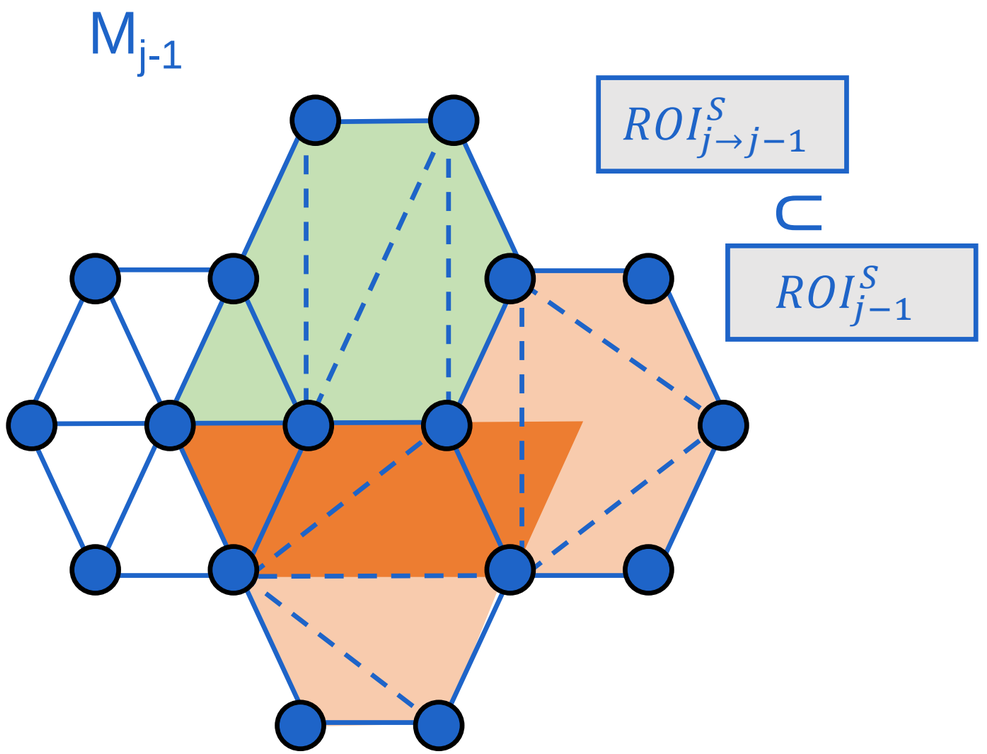

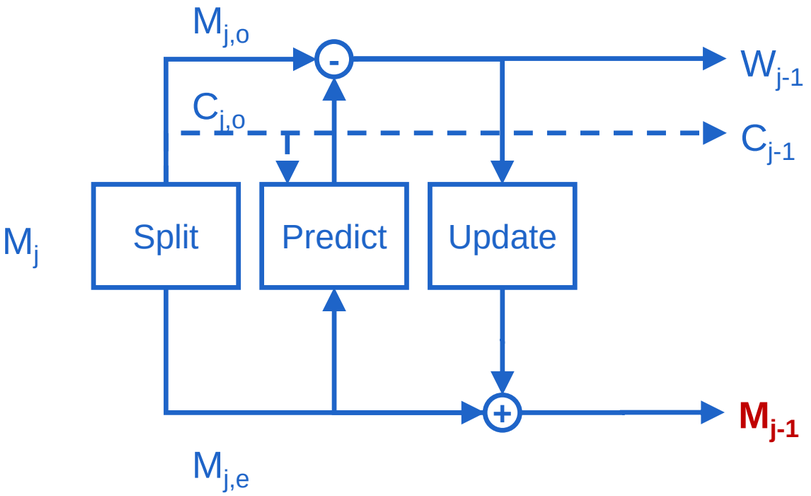

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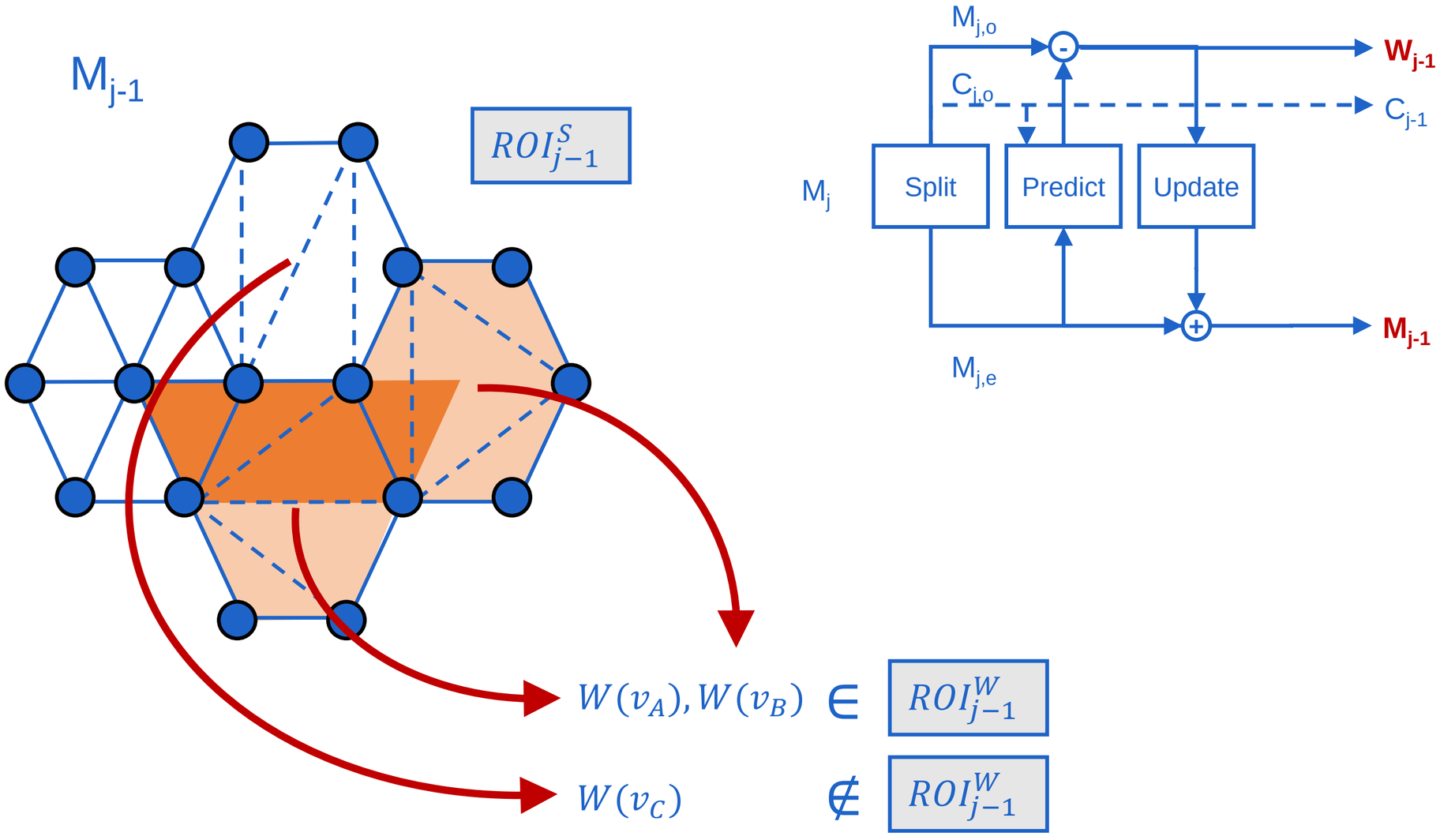
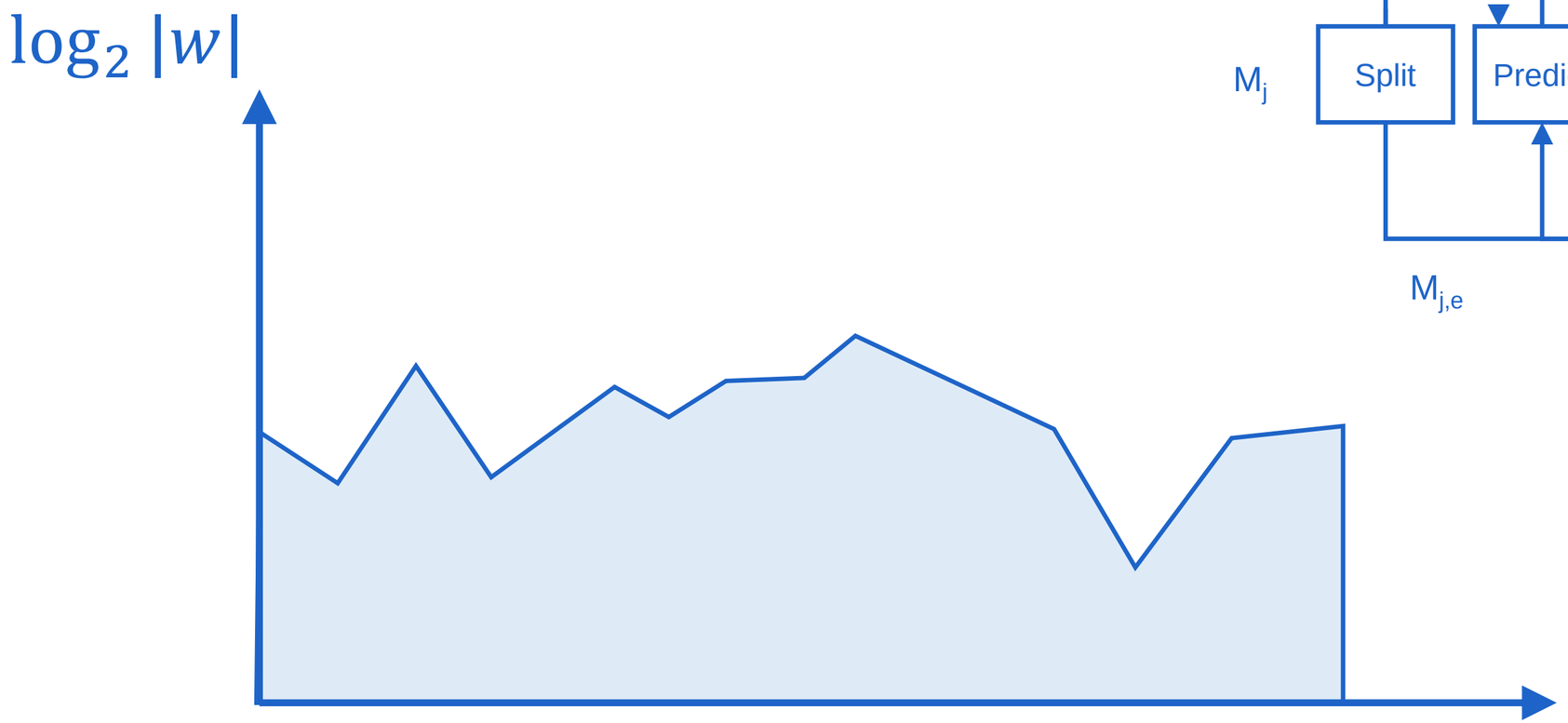
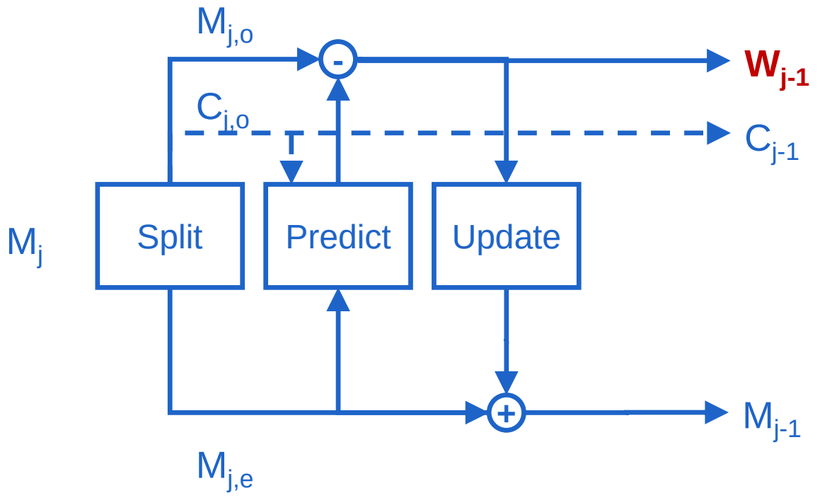


BOOSTED WAVELET COEFFICIENTS





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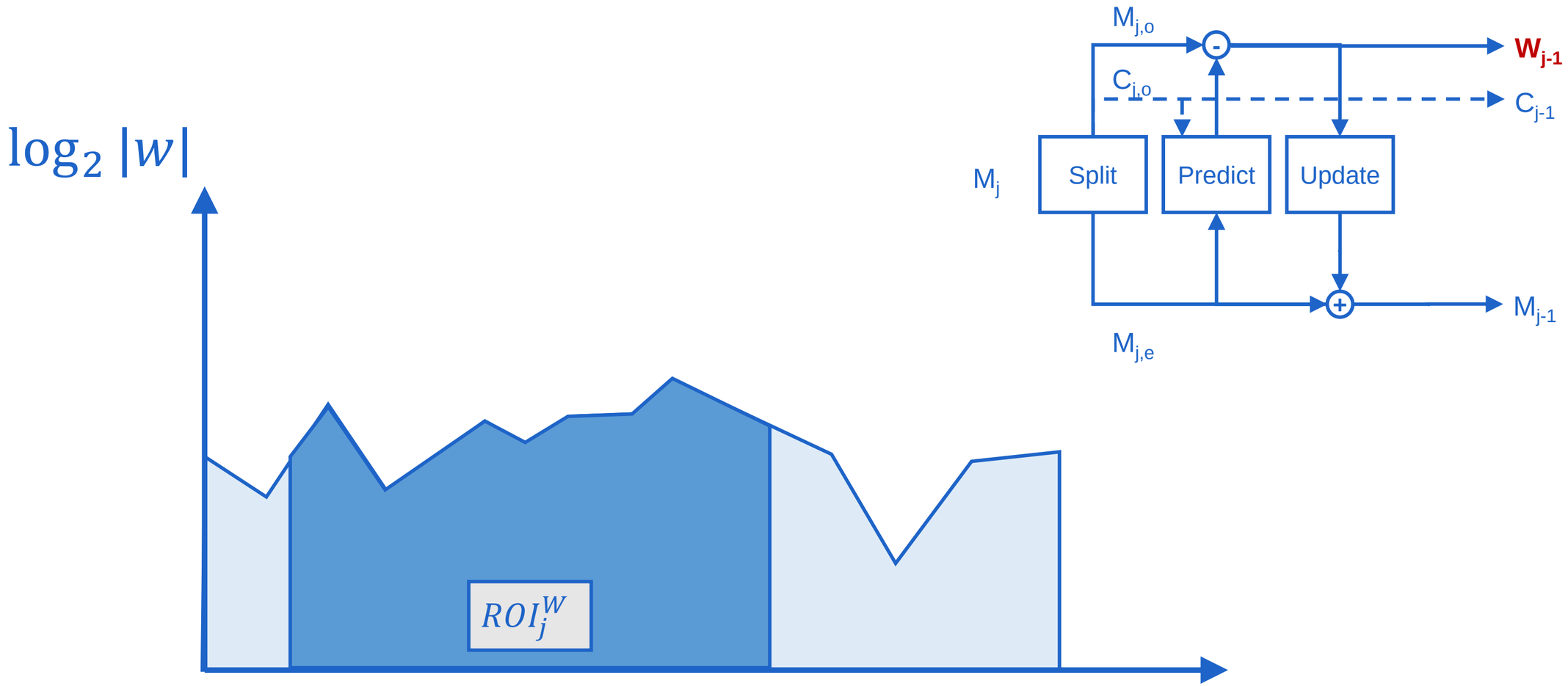

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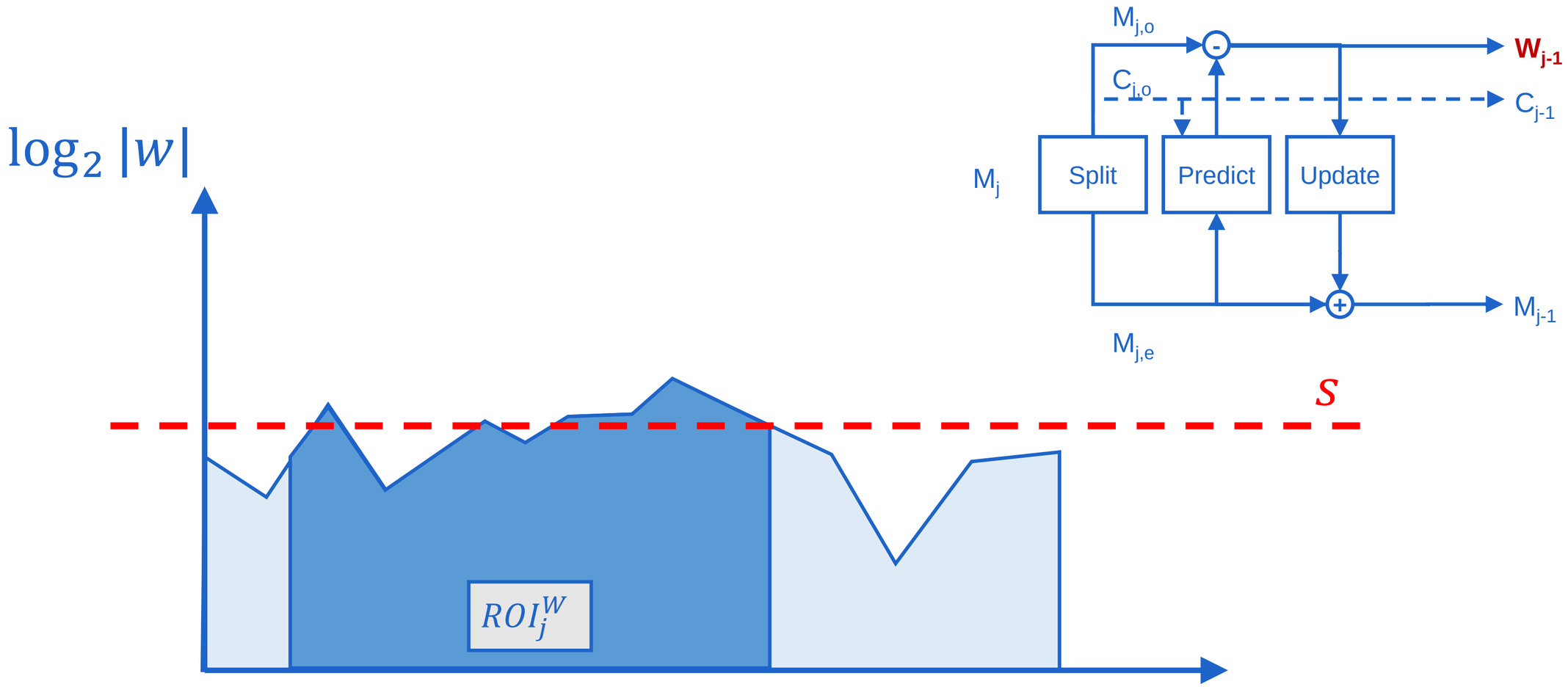

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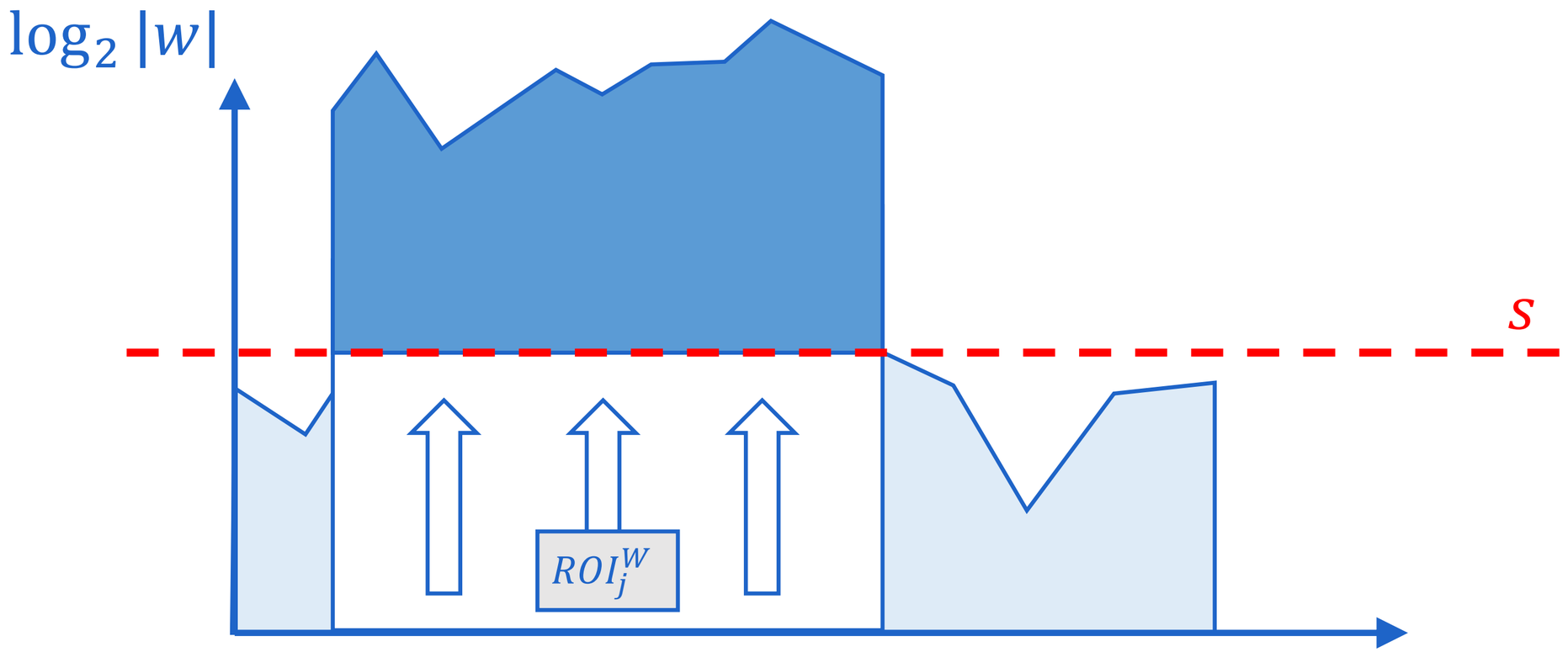
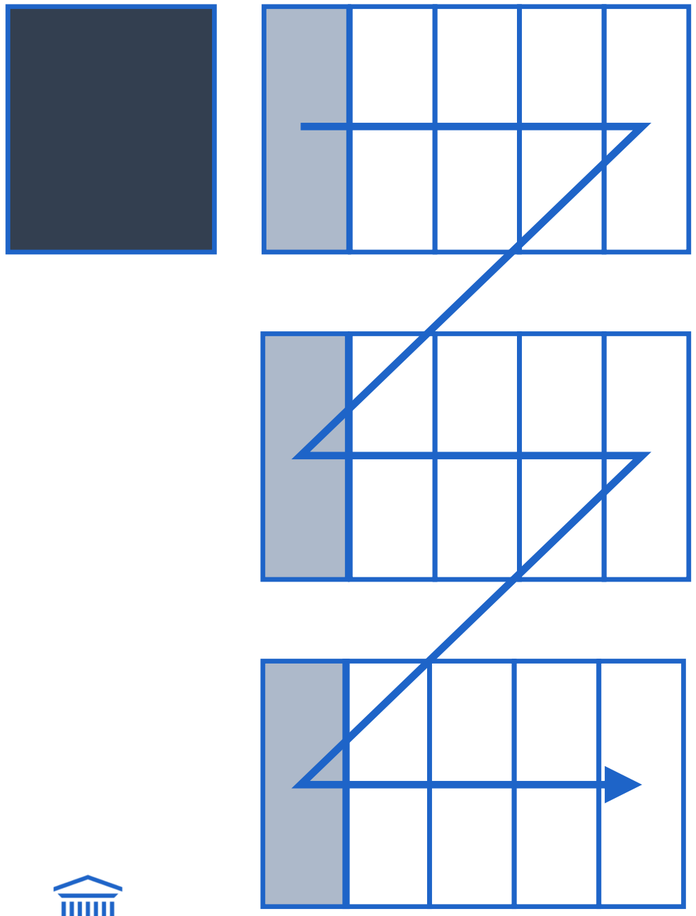


ROI-AWARE TRANSMISSION



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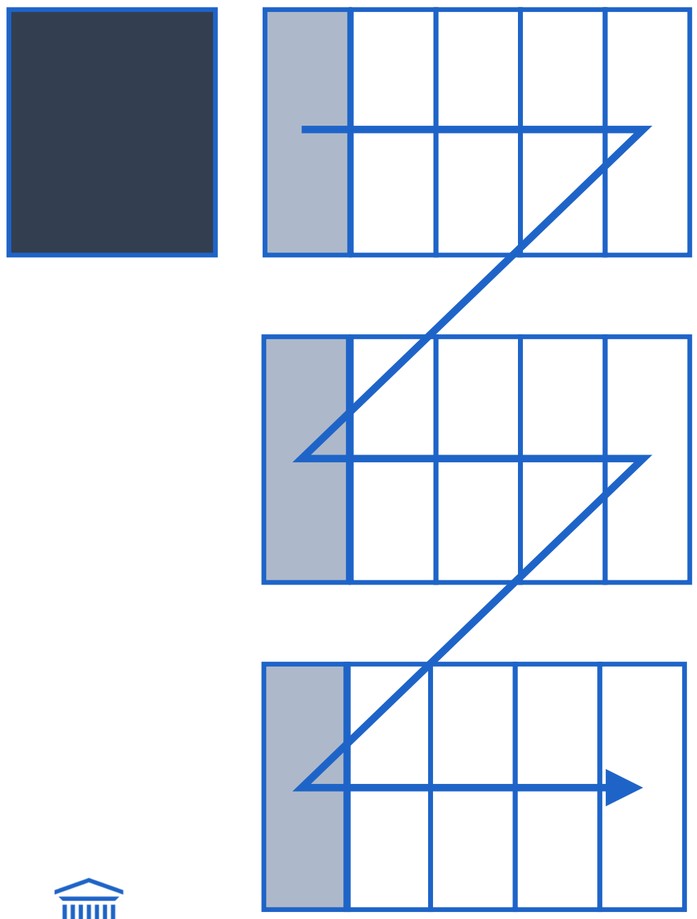

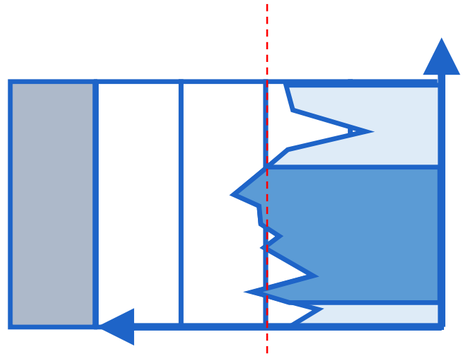

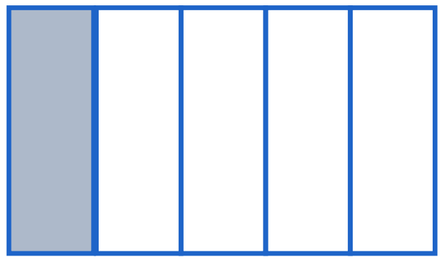

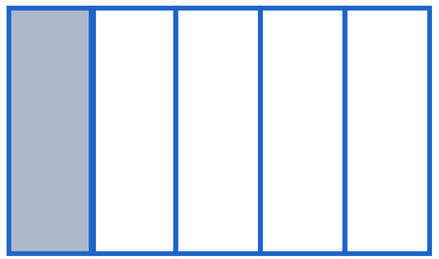

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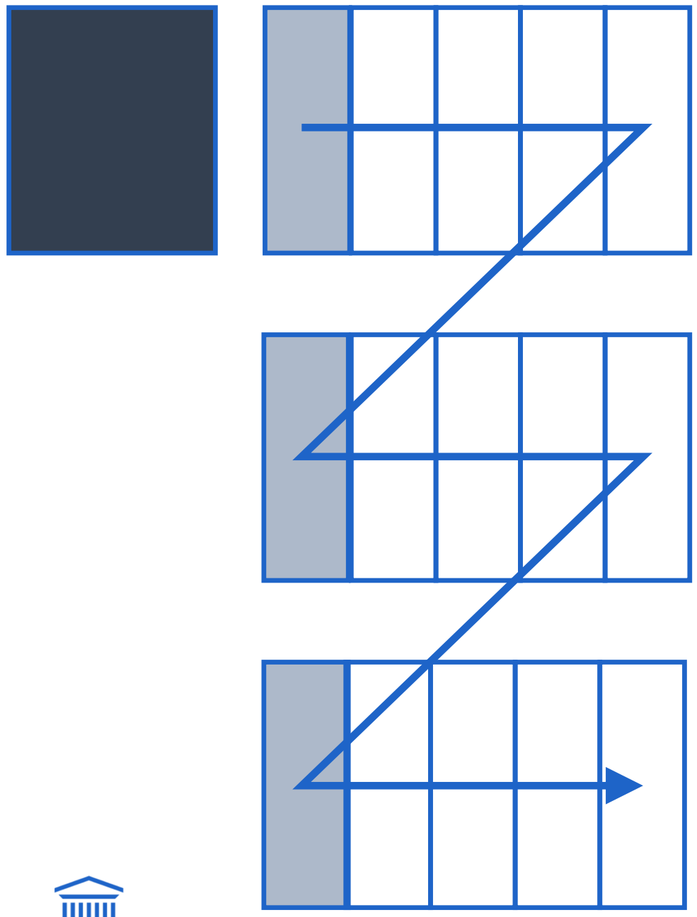

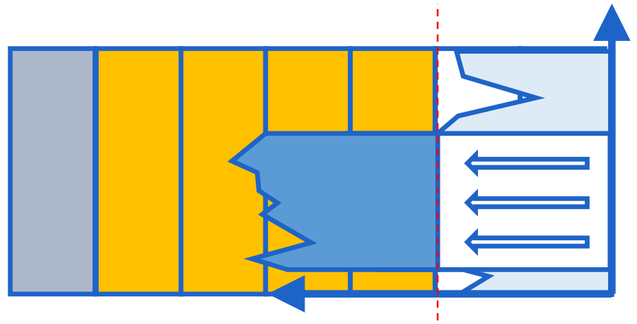

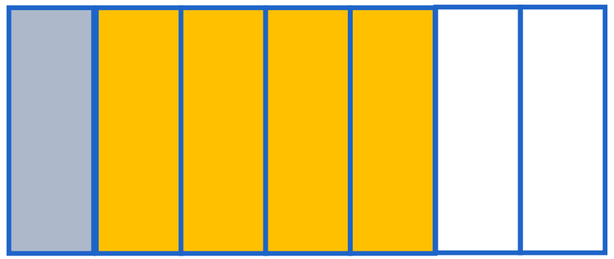

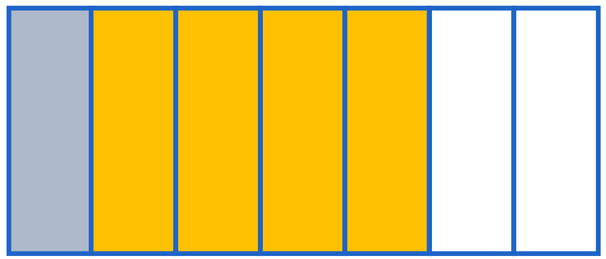

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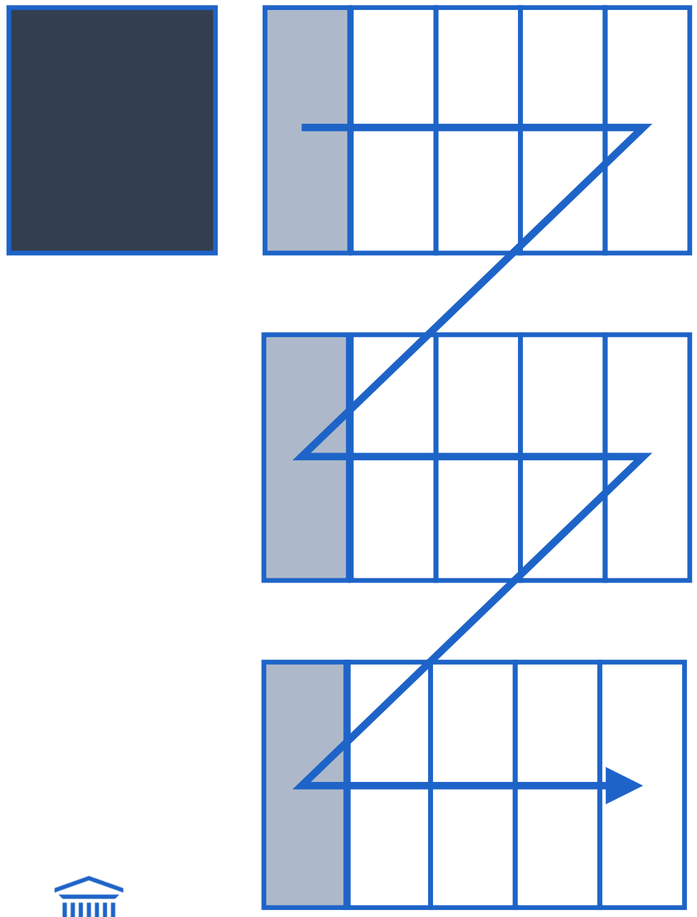

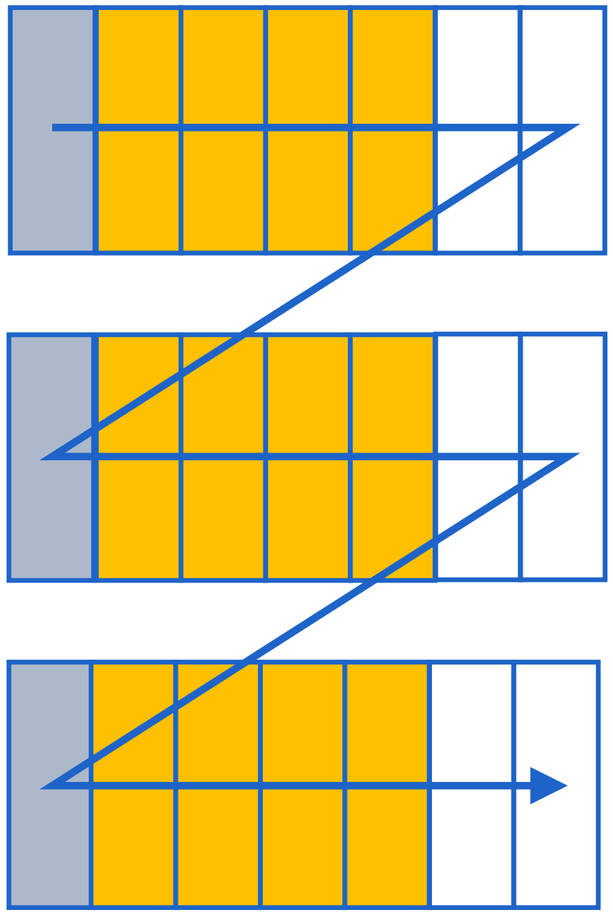

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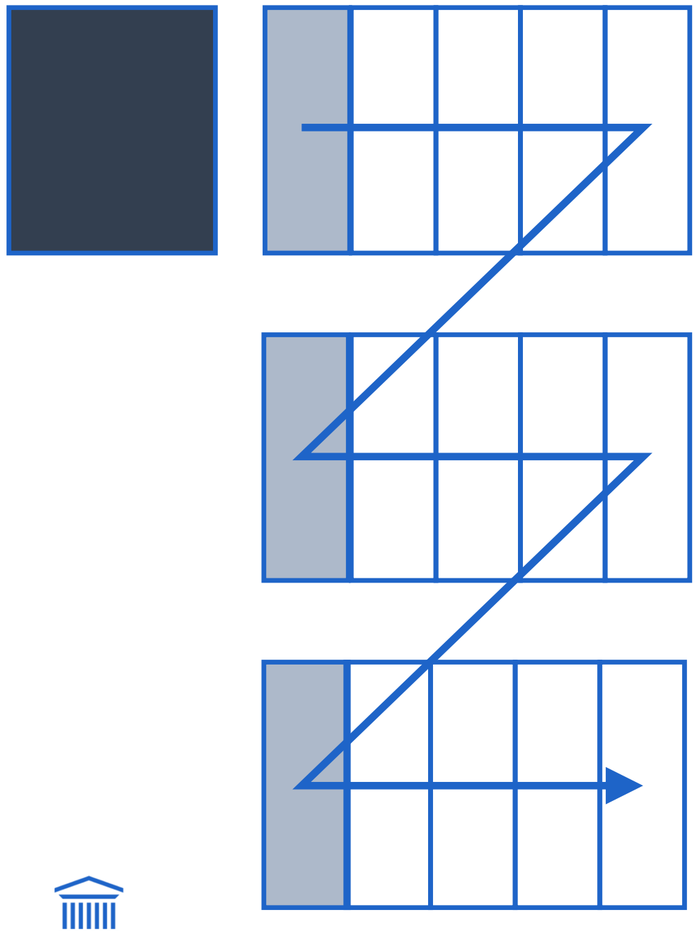

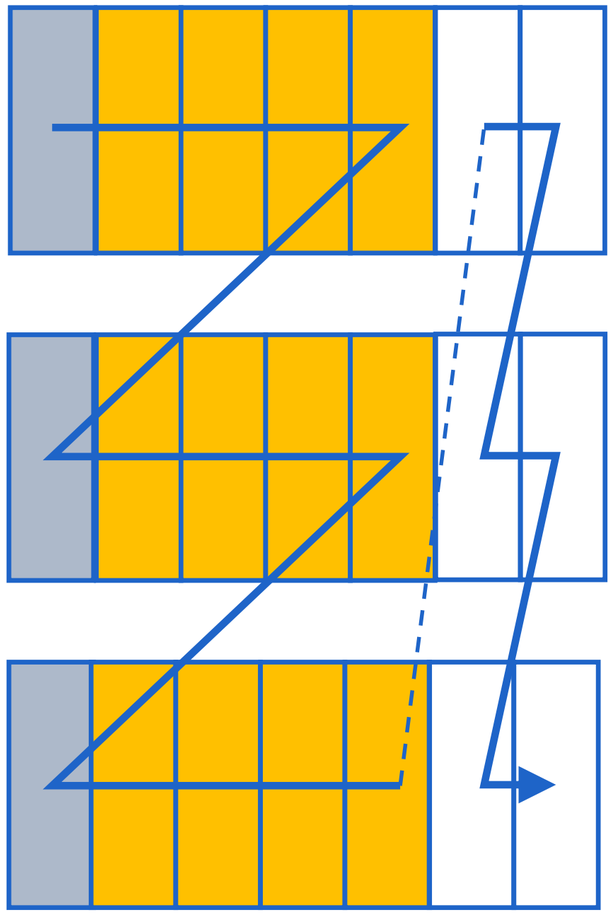

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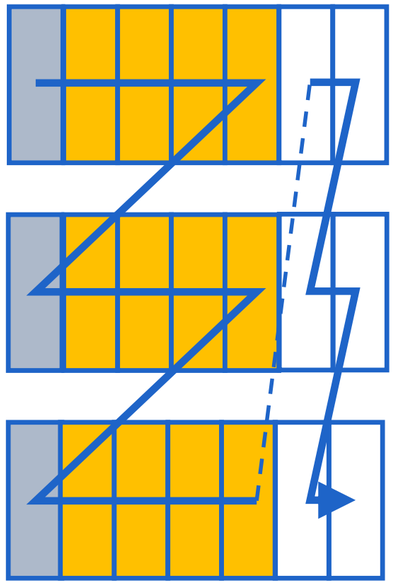
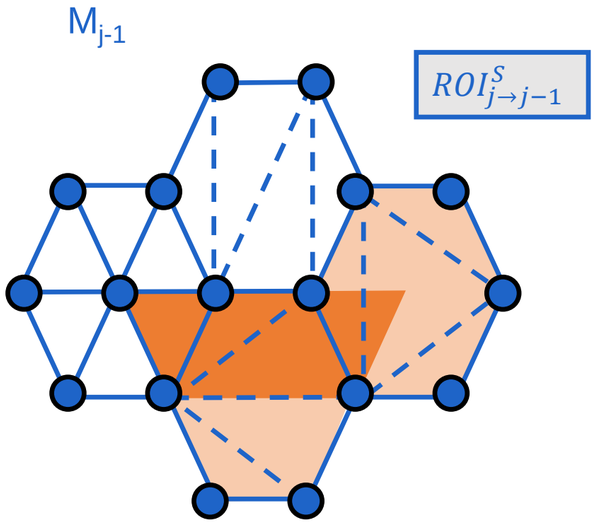
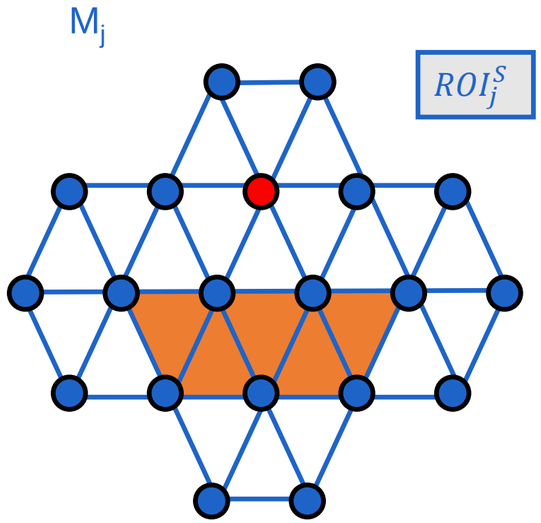
REGION-OF-INTEREST-AWARE INVERSE WAVELET TRANSFORM

ROI-AWARE INVERSE WAVELET TRANSFORM







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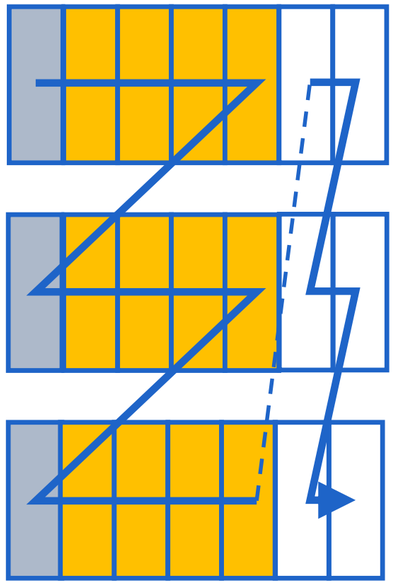

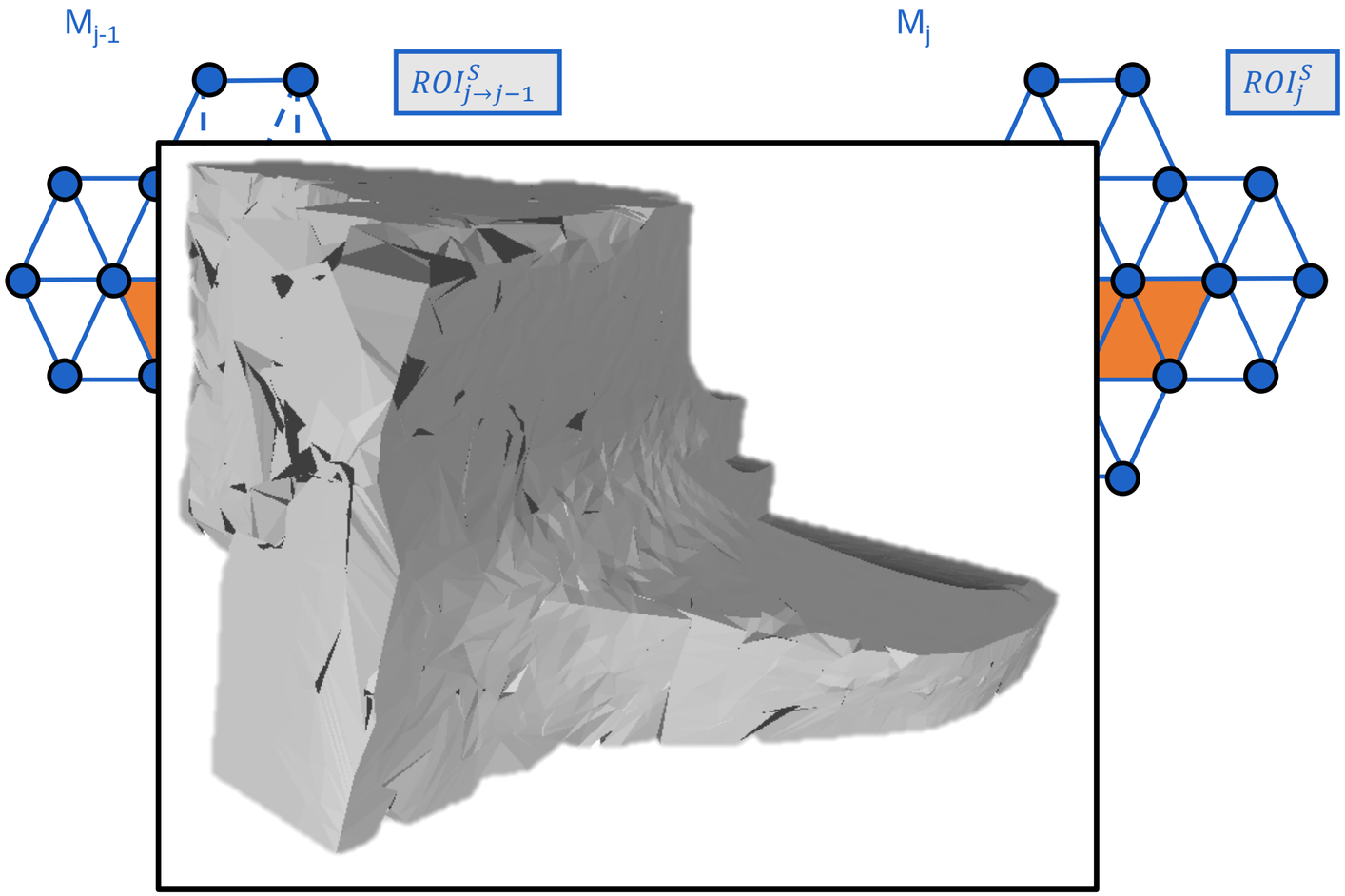

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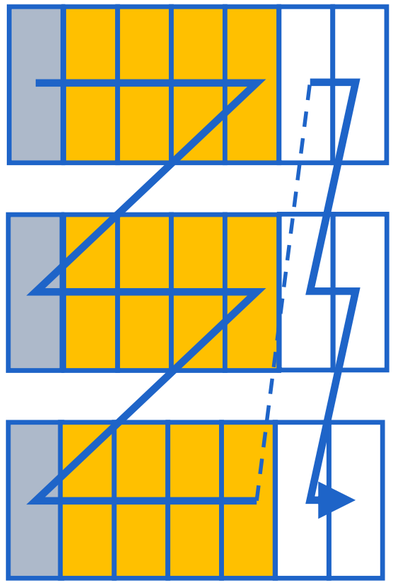

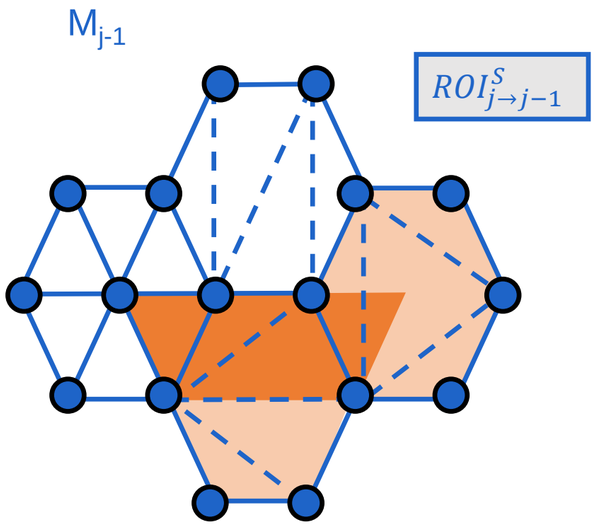

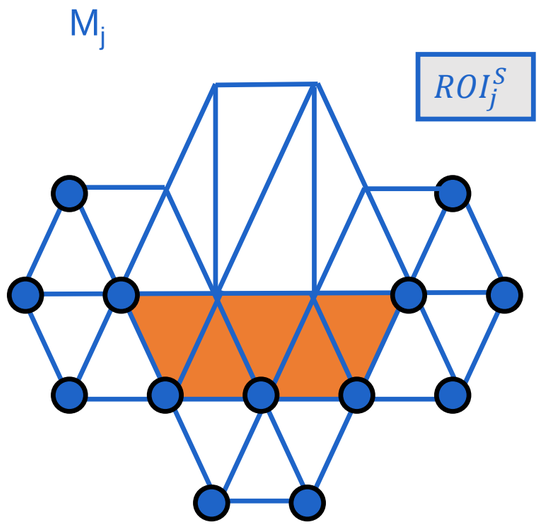

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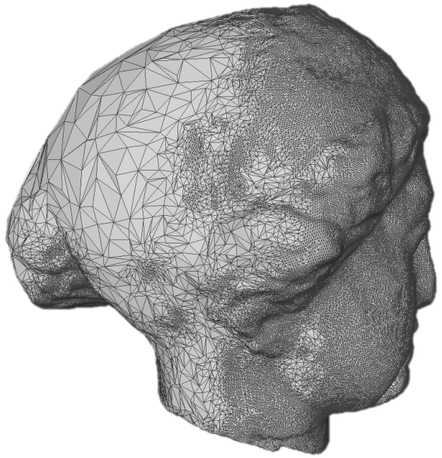
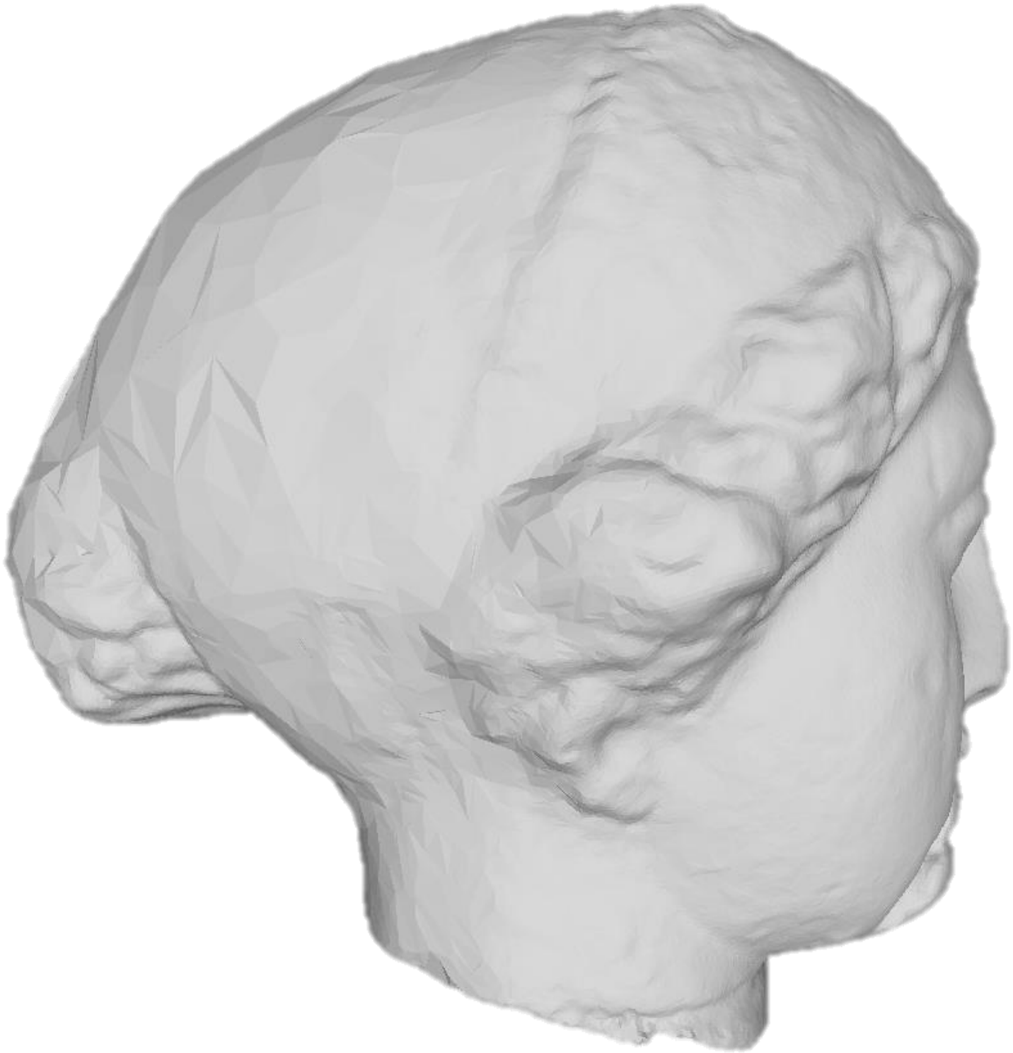
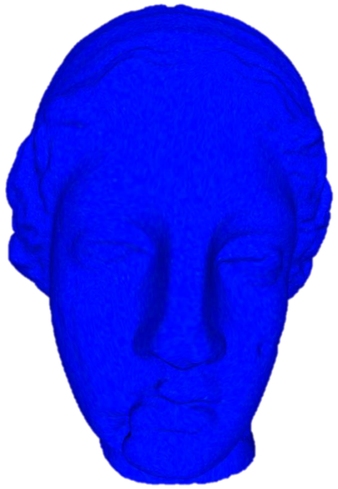
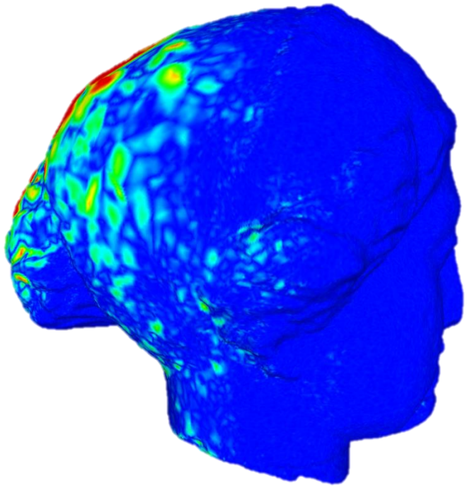
EVALUATION

ROI-AWARE INVERSE WAVELET TRANSFORM



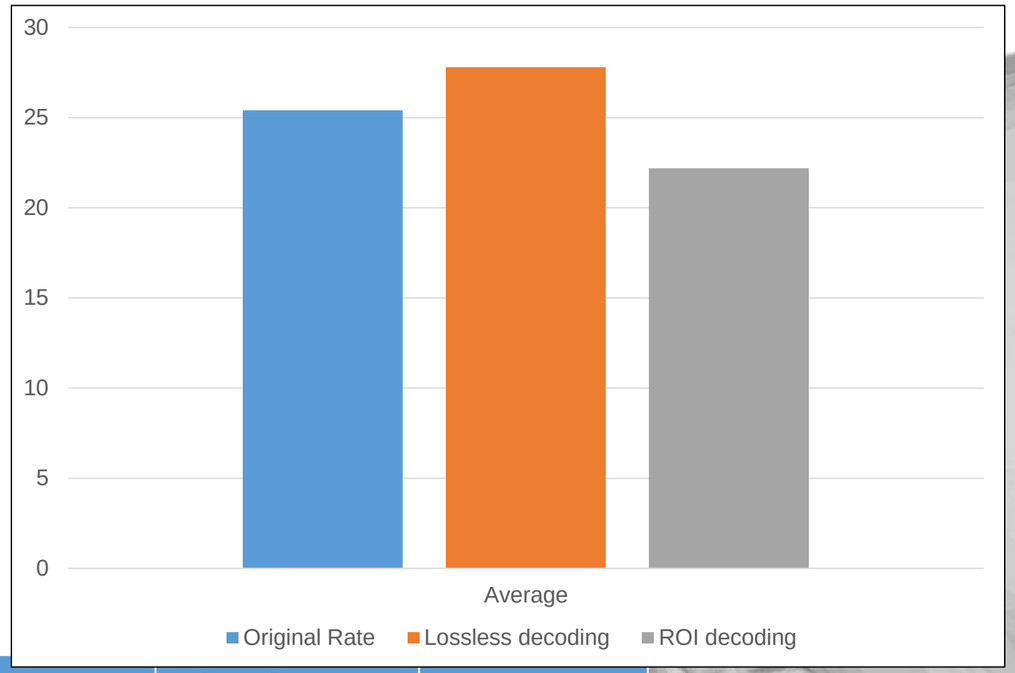




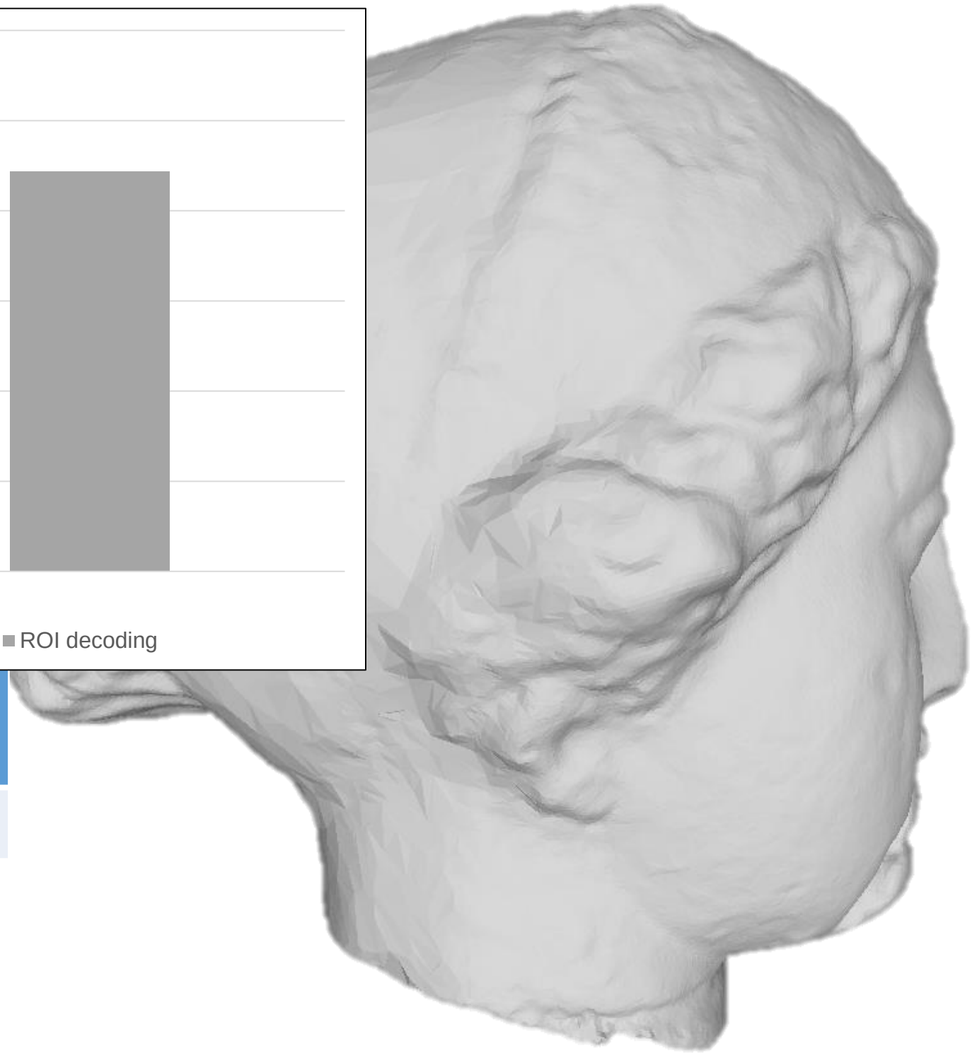


ROI-AWARE INVERSE WAVELET TRANSFORM

Model	rate	p	s	g	vert%
teapot (1 292)	32.7	4.05	6.71	2.66	74%
drill bit (1 961)	33.3	3.29	7.01	3.72	77%
beethoven (2 521)	34.1	3.13	5.06	1.93	83%
triceratops (2 832)	32.4	2.73	4.15	1.42	87%
elk (5 194)	30.5	3.03	5.97	2.94	76%
parthenon (5 936)	27.2	2.73	5.09	2.36	74%
atomium (6 150)	26.8	2.42	4.24	1.82	80%
fandisk (6 475)	26.2	2.71	6.43	3.72	63%
maxplanck (7 399)	29.6	2.87	7.89	5.02	66%
venushead (8 268)	29.6	3.03	6.86	3.84	70%
bimba (8 857)	30.1	2.67	5.84	3.16	75%
horse (19 851)	25.1	2.59	6.23	3.64	65%
bunny (34 834)	24.2	2.26	5.61	3.35	67%
vaselion (38 728)	27.4	2.27	5.26	2.99	75%
screwdriver (65 538)	20.6	2.15	5.44	3.29	56%
rabbit (67 039)	22.6	1.60	6.07	4.47	60%
golfball (122 882)	21.8	1.24	6.26	5.02	56%
dino (129 026)	19.9	1.90	4.01	2.12	66%
headus (131 074)	19.8	1.44	4.53	3.09	58%
armadillo (172 974)	20.8	1.73	5.08	3.35	62%
igea (198 658)	19.2	1.50	5.18	3.67	52%
fertility (241 607)	21.3	1.90	6.12	4.23	57%
feline (258 046)	18.7	1.85	4.27	2.43	54%
heptoroid (286 678)	20.1	2.22	5.30	3.08	52%
skeleton hand (327 323)	19.8	2.09	5.44	3.35	50%



Model	Original Rate	Rate Penalty	Rate Saved	Final Gain	Vertex%
Average	25.4*bpv*	**+2.376*bpv***	**-5.602*bpv***	**-3.226*bpv***	66%



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CONCLUSION

CONCLUSIONS

- Introduced ROI coding for irregular mesh codecs
  - **Scaling wavelet coefficients**
  - **ROI-aware inverse wavelet transform**
- Encoder can **prioritize** regions
- Example use-case: visually lossless
  - at reduced bitrate (bandwidth ↘)
  - at reduced vertex count (memory ↘)

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