B74 (Fri-AM)

Recognizing Surgical Phases Anywhere (**SPA**)
Few-Shot Test-time Adaptation and Task-graph Guided Refinement

Kun Yuan[13], Tingxuan Chen[3], Shi Li[1], Joel L. Lavanchy[4], Christian Heiliger[5], Ege Özsoy[3], Yiming Huang[6], Long Bai[6], Nassir Navab[3], Vinkle Srivastav[12], Hongliang Ren[6], Nicolas Padoy[12]

[1] University of Strasbourg, CNRS, INSERM, ICube, UMR7357, Strasbourg, France
[2] IHU Strasbourg, Strasbourg, France
[3] CAMP, Technische Universität München, Munich, Germany
[4] University Digestive Health Care Center – Clarunis, 4002 Basel, Switzerland
[5] Ludwig Maximilian University of Munich, Munich, Germany
[6] Chinese University of Hong Kong, Hong Kong SAR, China

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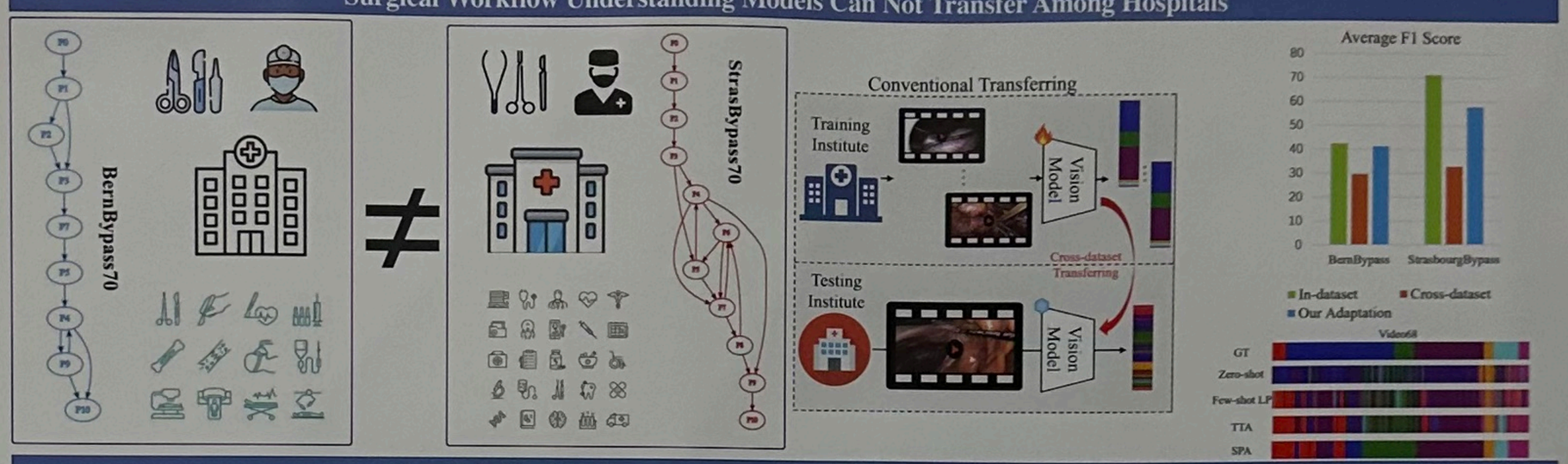
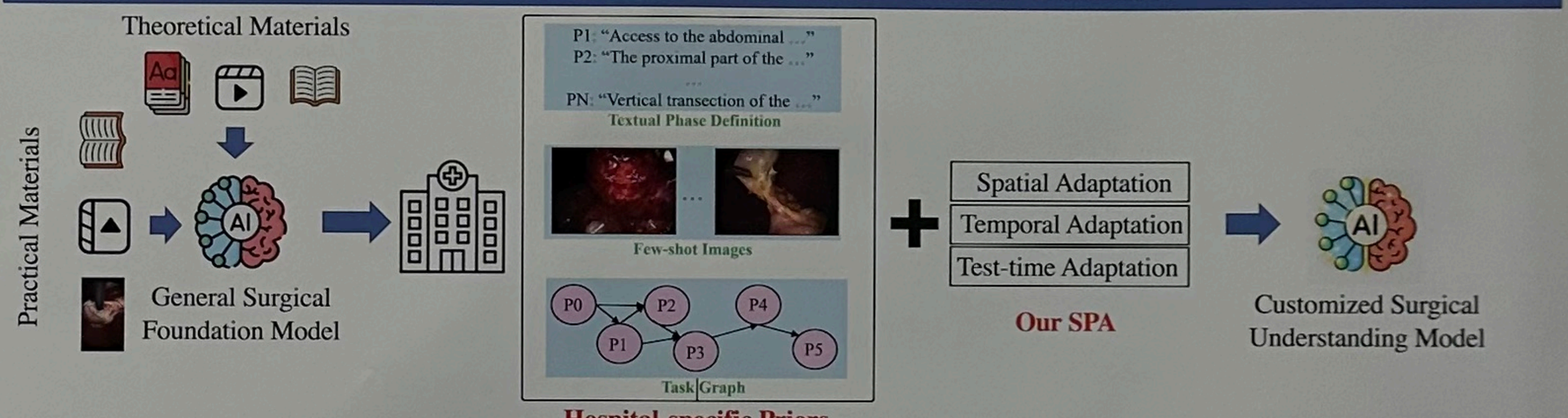
Surgical Workflow Understanding Models Can Not Transfer Among Hospitals

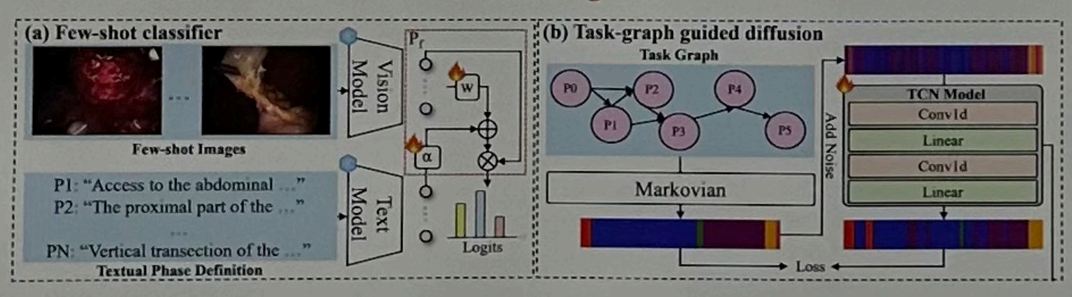


Hospitals Need to Customize Foundation Model to Their Own Domain

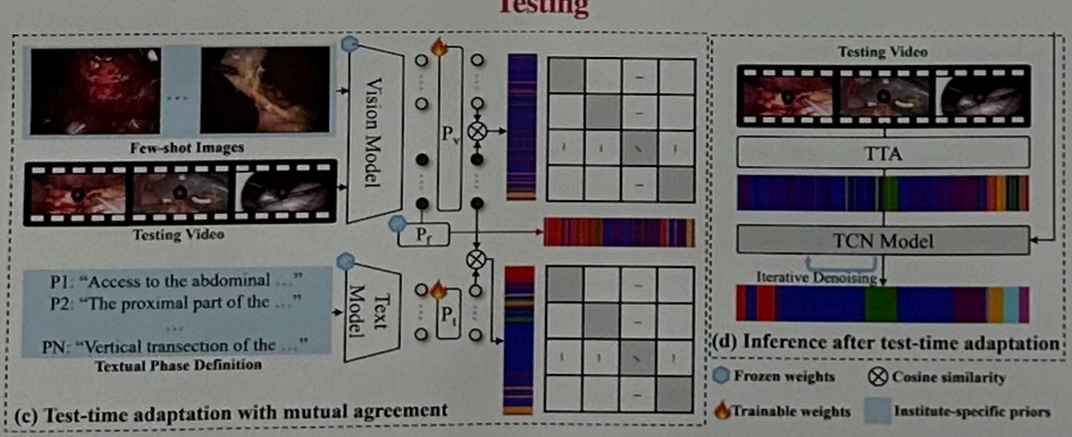


Handle Domain Gaps with Spatio-temporal Adaptations

Training



Testing



Surgical Phase Recognition

Methods	Shots	Cholec80	StrasBypass	BernBypass	Autolaparo
CLIP [15]	0	13.1	5.5	4.1	18.3
PeskaVLP [26]	0	34.2	28.6	22.6	28.6
RN50 Full	Full	80.3	71.1	42.4	NA
Tip-Adapter-F [28]	1	29.29±0.53	14.88±0.03	14.29±0.00	26.58±0.00
Linear probe (LP) [17]	1	26.19±6.75	24.70±3.64	14.95±1.35	33.90±5.19
LP+text [17]	1	32.21±1.88	23.53±3.59	14.12±2.36	32.80±5.81
SPA	1	44.53±5.77	30.68±5.24	24.31±4.29	51.48±6.26
Tip-Adapter-F [28]	16	40.75±2.15	34.29±2.12	24.54±1.97	37.51±1.31
Linear probe (LP) [17]	16	39.06±1.04	38.48±1.88	27.36±0.45	42.60±2.78
LP+text [17]	16	38.24±2.33	35.42±1.35	25.01±0.50	39.43±4.83
SPA	16	55.05±4.80	52.39±1.88	38.73±1.58	58.91±4.72
Tip-Adapter-F [28]	32	42.05±1.04	35.83±4.08	26.98±1.68	39.75±2.11
Linear probe (LP) [17]	32	38.37±1.37	42.79±0.61	29.74±0.85	44.72±1.25
LP+text [17]	32	38.36±1.81	40.35±1.25	26.01±0.79	39.40±3.35
SPA	32	55.69±3.99	55.80±1.32	43.54±1.96	60.36±3.14

Conclusion

Surgical Phase Anywhere (SPA) offers a lightweight, data-efficient framework for cross-institution surgical phase recognition. By combining few-shot spatial adaptation, task-graph-guided temporal modeling, and dynamic test-time adaptation, SPA achieves robust generalization with minimal annotation, enabling scalable and reliable deployment across diverse surgical environments.

References

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