# FedPref: Federated Preference Learning for Structured Radiology Report Extraction

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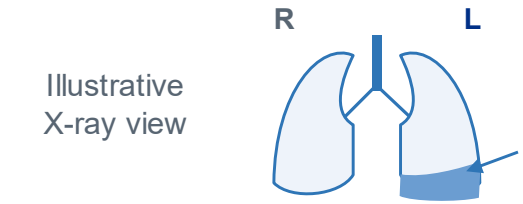
# Motivation – Preference Learning

**Radiology report**

*"… a small left pleural effusion is present …"*




**Structured records**

```
disease:  pleural effusion
location: left lung
```

✓

```
disease:  pleural effusion
location: right lung
```

✗

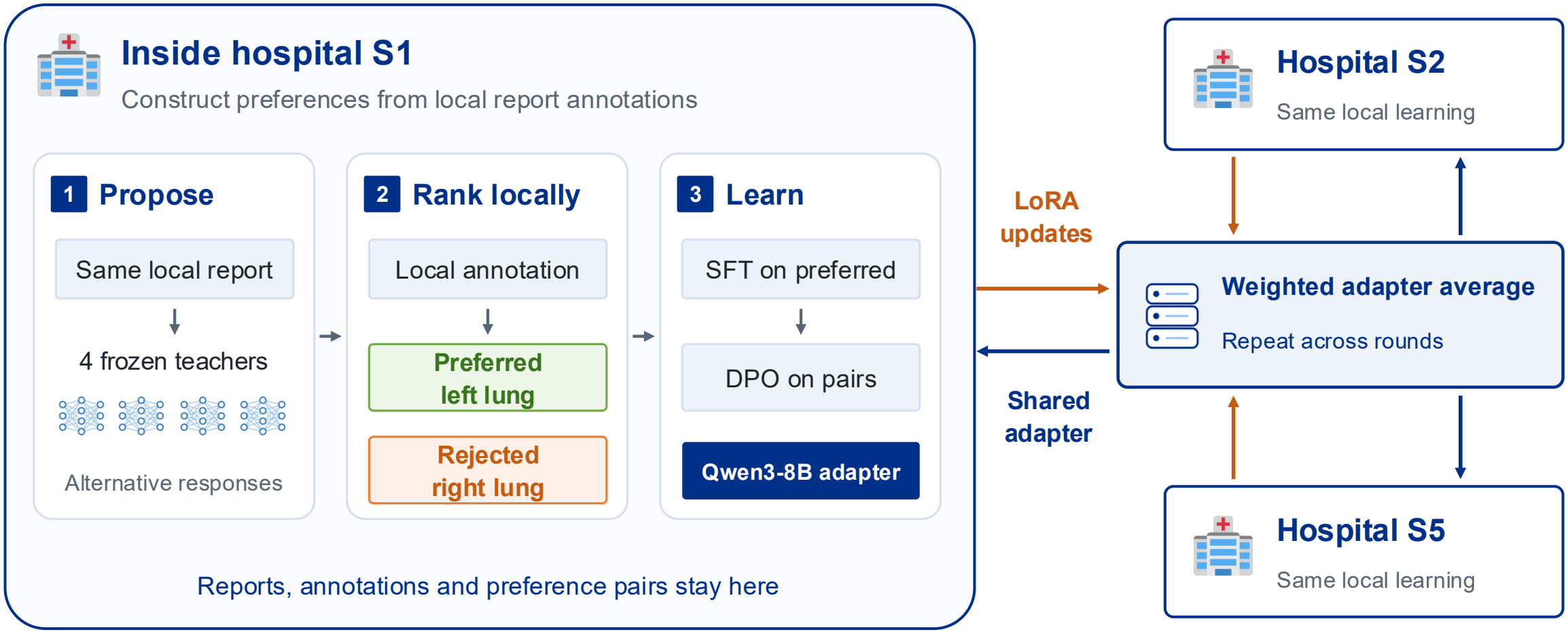
**Illustrative hospital network**

| S1 | S2 | S3 | S4 | S5 | … |
|---|---|---|---|---|---|
| 1,000+ reports | 500+ reports | 500+ reports | 100+ reports | 10+ reports | |

**Q.** Can a hospital network improve a shared model through preference learning, while keeping each hospital's patient data and feedback local?

# FedPref: Local Preferences, Shared Learning

Build preference pairs locally. Share only what the model learns.




## Local preference signals → one shared model adaptor

# Does Collaboration Help?

**MIMIC-CXR**
**+ Chest ImaGenome**

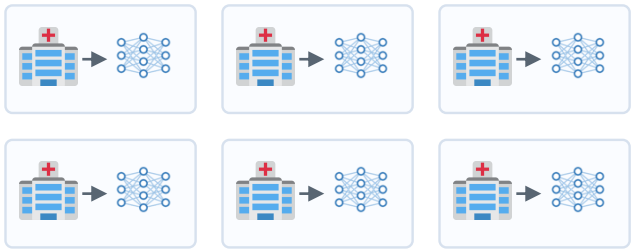
Reports + annotations

**6 simulated hospitals**

Unequal data volumes · Different disease mixes

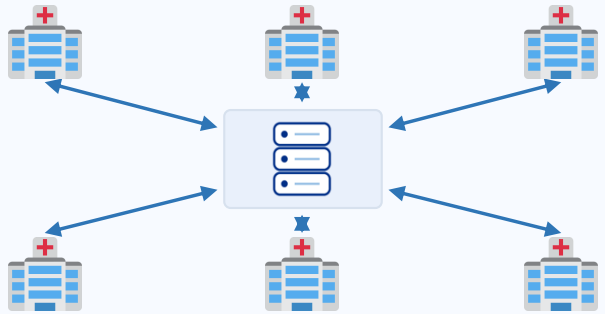
Qwen3-8B · Same preference pairs · Matched training exposure

## Local



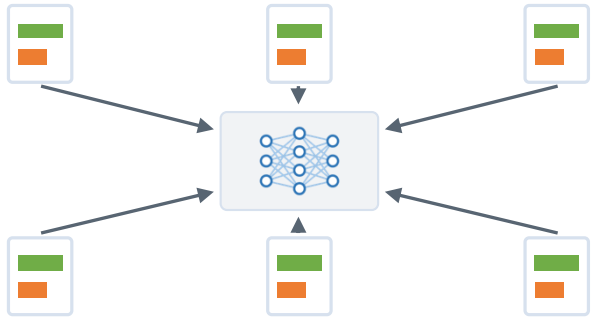
Train independently

## FedPref



**Share adapters**

## Central

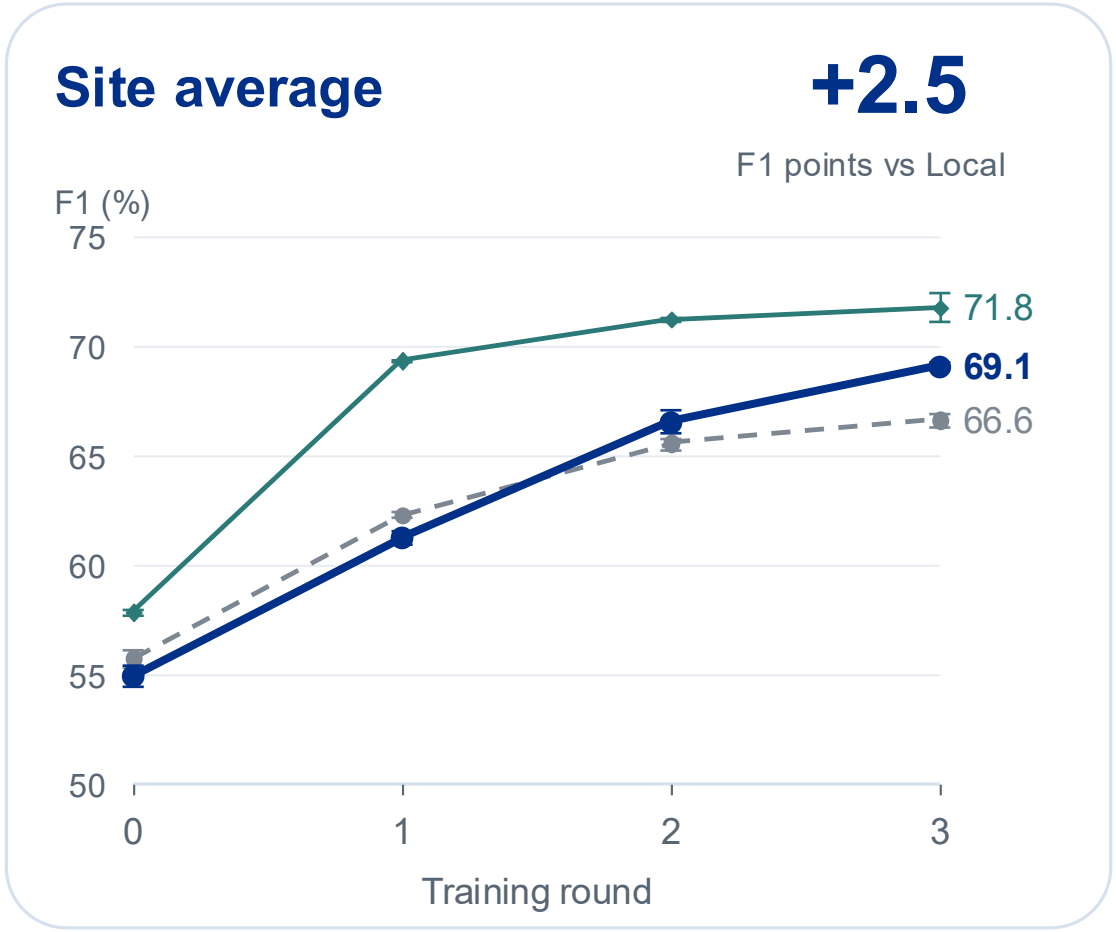


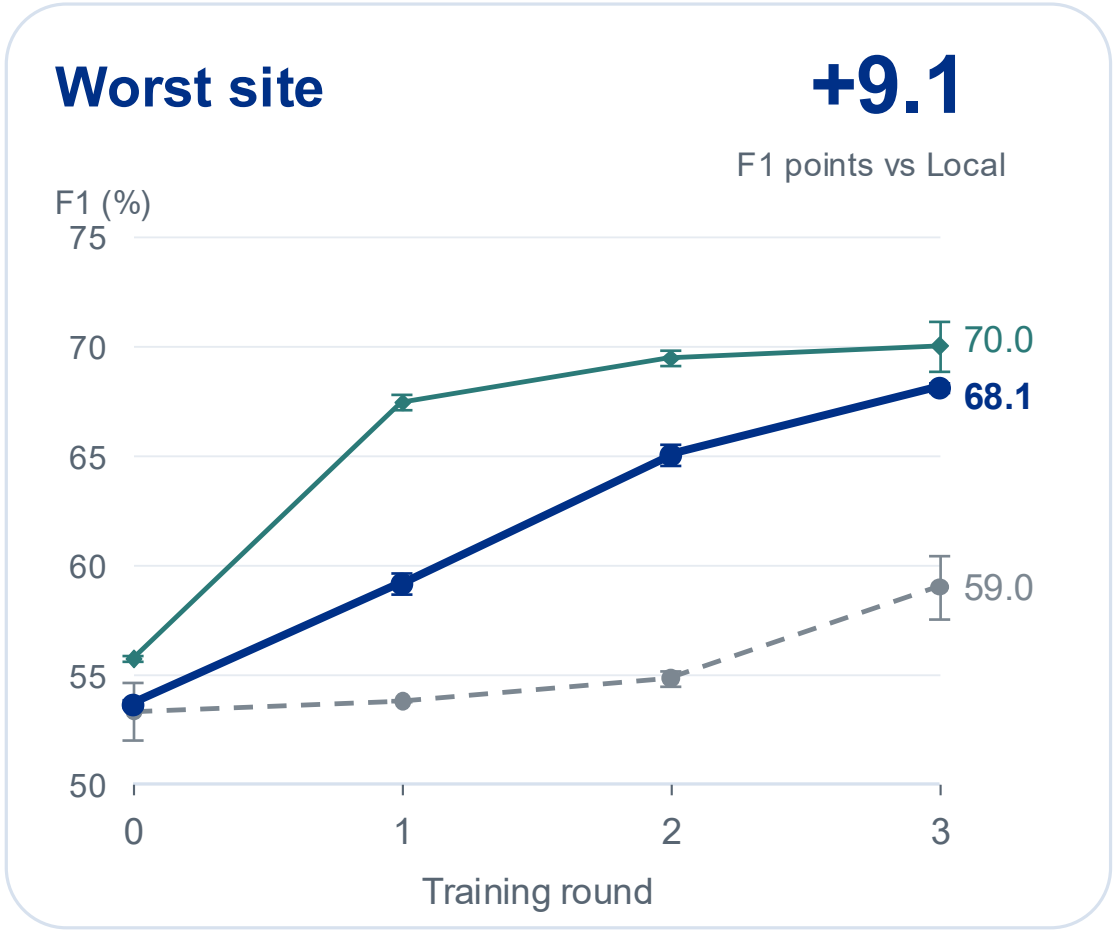
Pool preference pairs

## Disease + location F1, averaged across hospitals

Both must be correct

# Collaboration Improves Average Performance




Development · Disease + location F1 · Mean ± SD over 3 seeds

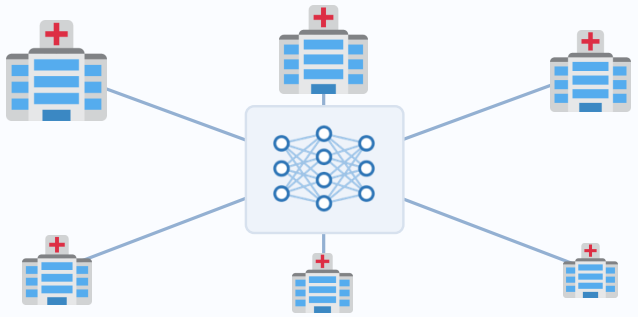
Local **FedPref** Central

**+2.5 F1 on average over isolated learning; worst site gets significant performance boost**

# Conclusion

## Radiology study

Six simulated hospitals



**Strongest gains at smaller sites**

## Next: real hospital networks

Local records · Clinical workflows

**Test learning across independent sites**

## Hospitals learn together from local preferences.

Patient records and feedback stay local.

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# THANK YOU

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