Learning to transfer: transferring latent task structures and its application to person-specific facial action unit detection

Domain

AU4 Brow Lowerer
AU9 Nose Wrinkle
AU6 Cheek Raise
AU7 Lids Tight
AU12 Lip Corner Puller
AU43 Eye Closure
AU25 Lips Part
AU26 Jaw Drop

FACS Action Units (AU) provide objective description of facial expressions

Problem

- Manual AU annotation is extremely costly

- Poor generalisation to unseen conditions

- Large impact of extrinsic factors (e.g. identity)

- Some AU are rare, some are common

Solution

- Person specific models in Multi-Task learning

- Use common / easier AUs to improve detection of rare / hard with Transfer learning

- Regularised Latent Task Structure (RLTS) framework

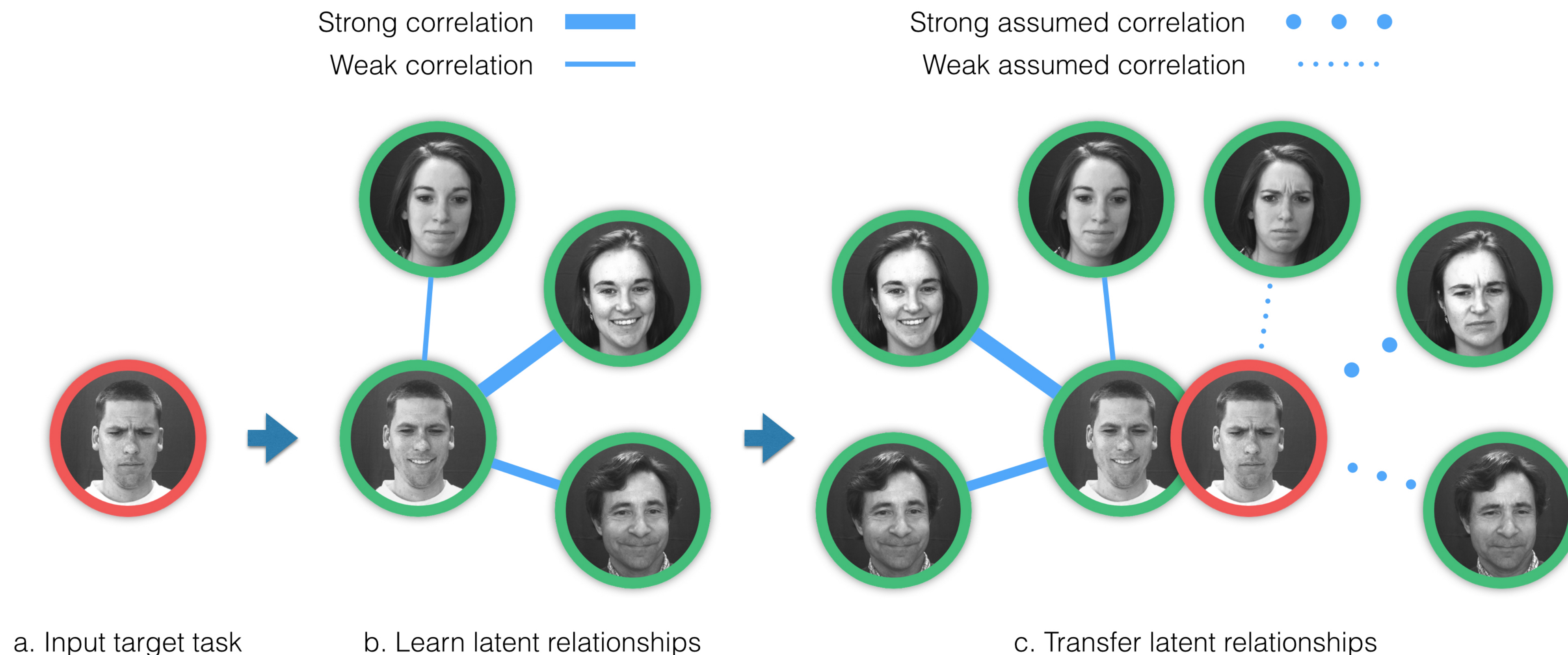# Regularised Latent Task Structure
Framework Overview

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Strong correlation
Weak correlation
Strong assumed correlation
Weak assumed correlation

a. Input target task

b. Learn latent relationships

c. Transfer latent relationships

RLTS first estimates degrees of relatedness among the person-specific tasks of an AU, that is easy to detect and annotate. It then transfers that information to a target hard to detect AU model, making it possible to obtain discriminative models in either absence of the target AU labels or their limited availability.
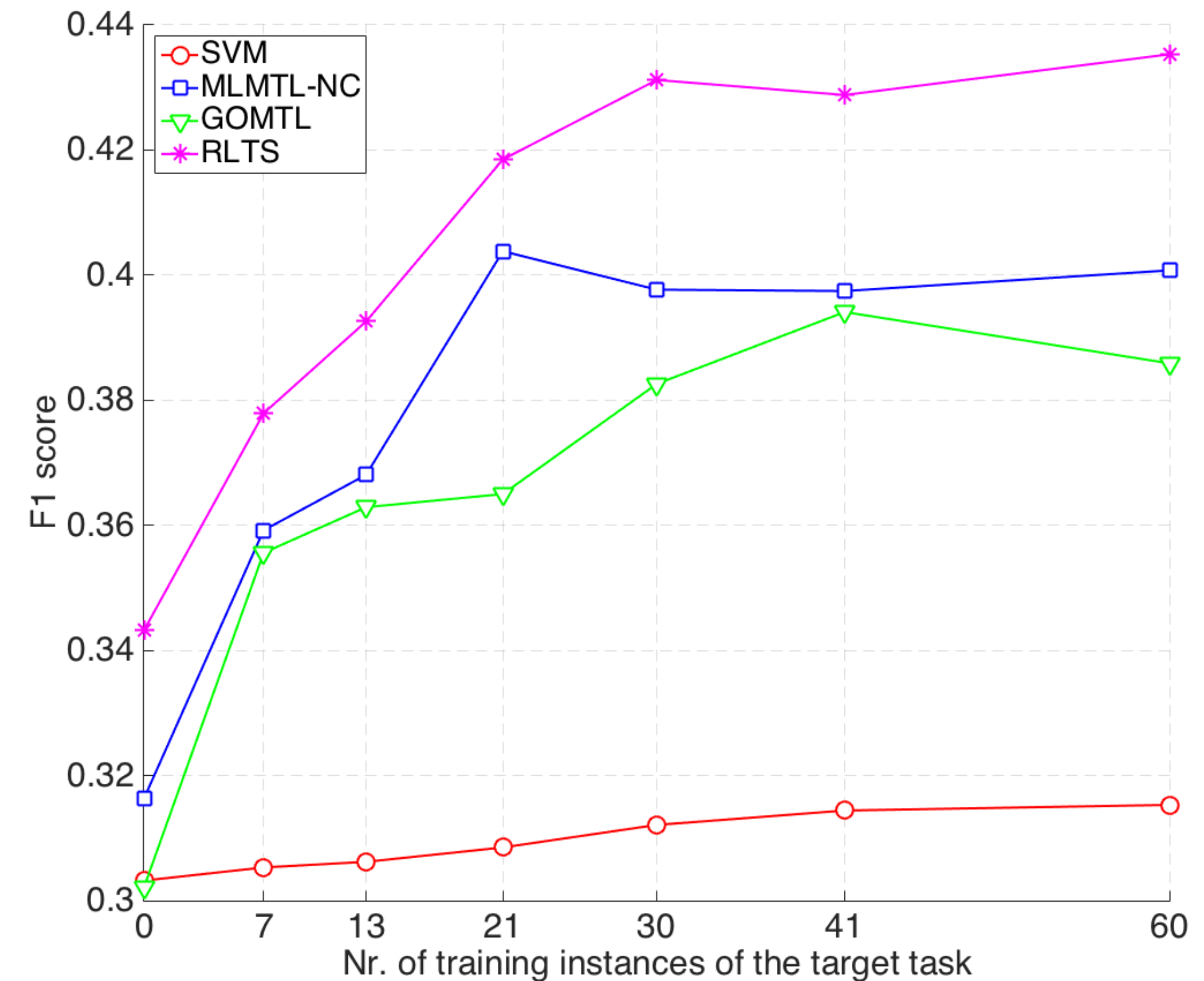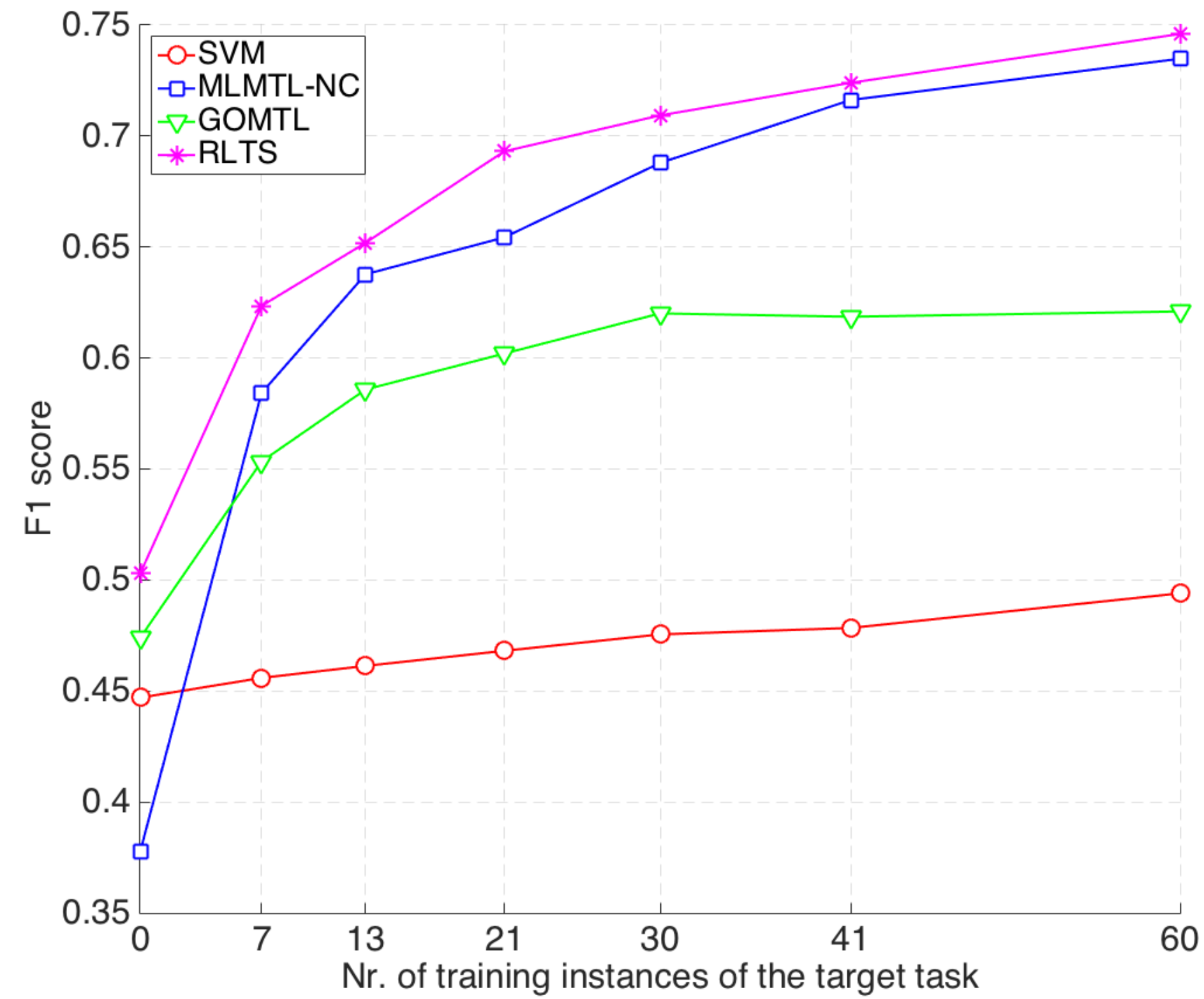
Regularised Latent Task Structure
Evaluation

Evaluation of RLTS vs SVM, Multi-Task Multilinear (MLMTL-NC) and Grouping and Overlap for Multi-Task learning (GOMTL) on the **DISFA** (left) and **McMaster** (right) datasets. The graphs demonstrate how performance of each method changes while the amount of labelled training data of the target AU increases from 0 to 60.