Domain adversarial neural networks regression to design transferable impression estimation model for clothing patterns

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Introduction

- To reduce the loss of natural resources and realize a sustainable society
  - Understanding users' needs and preferences
  - Understanding users' emotional values
  - ➤ Impressions evoked by a design → quantification → a design based on the user's emotional values

- Problem
  - Need to quantify visual impressions every time the target field (domain) changes
  - Extremely high experimental cost

- Purpose
  - **Construct a model to predict impressions from clothing patterns**, a domain with insufficient labeled data, using transfer learning that transfers information between domains

Proposed Method
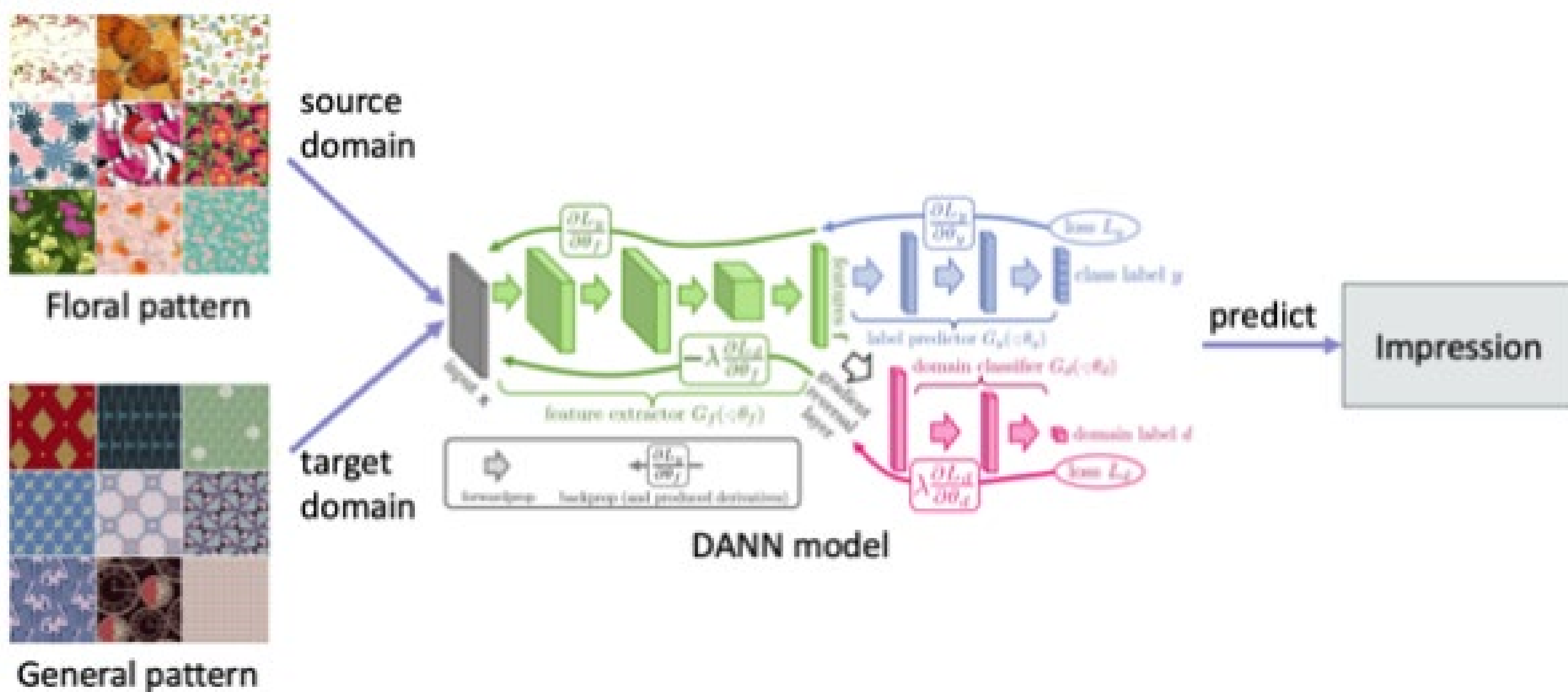
1. Data Preprocessing

- Source
  - Domain: 3098 images of floral patterns
  - Task: Estimation of 4 impression words ("cute," "bright," "cheerful," "cool")

- Target
  - Domain: 2878 images of general patterns **different marginal probability distribution (the number of images of floral and general patterns)**
  - Task: Estimation of 4 impression words ("cute," "bright," "cheerful," "cool") **different conditional probability distribution (frequency of label appearance）**
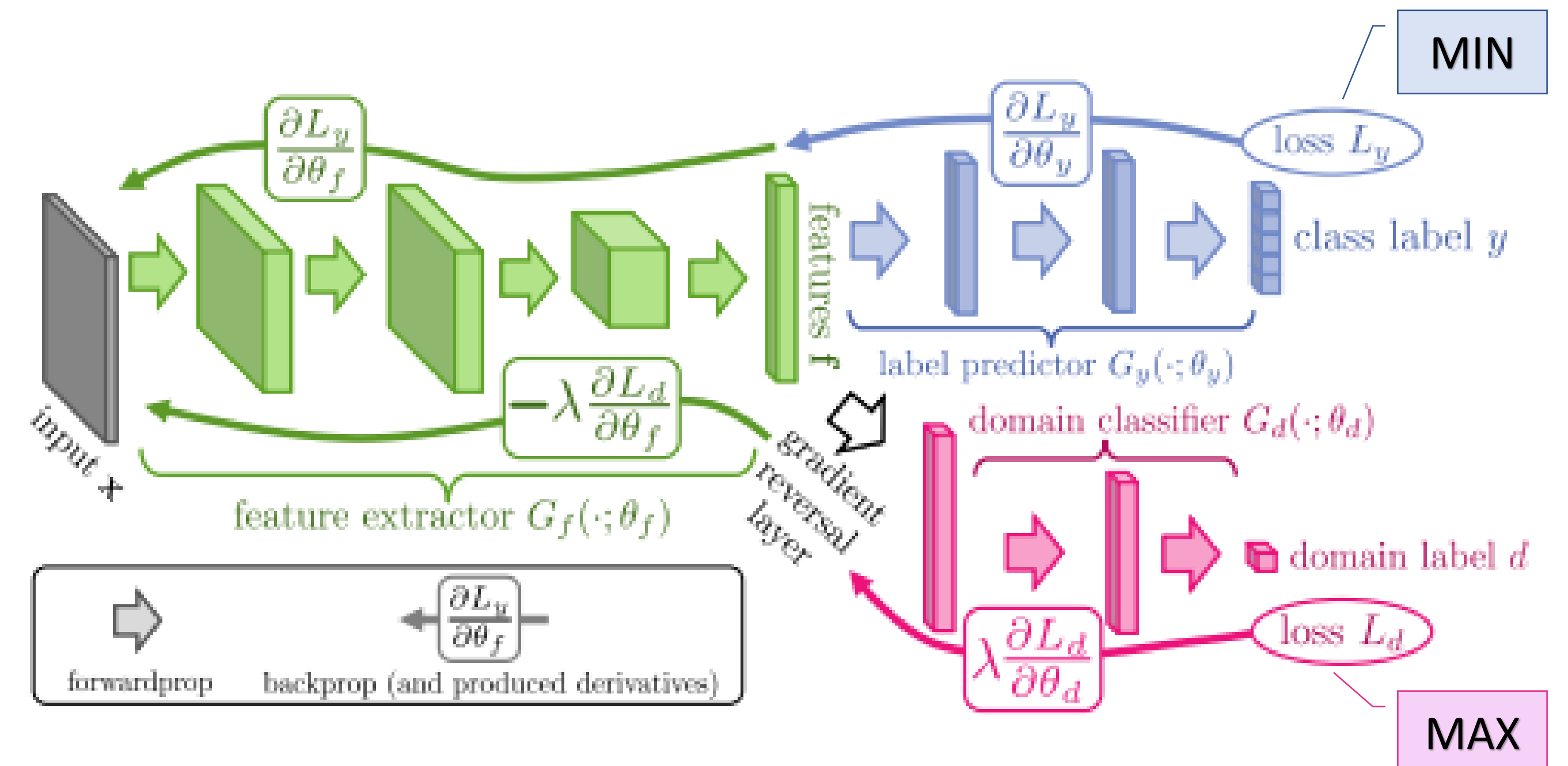
**Source Domain ≠ Target Domain
Source Task ≠ Target Task**

- Creating Train and Test data
  - Create train data and test data with reliable variation to improve learning accuracy.
  - Clustered the data into groups by using CNN Style features
  - Randomly extract train data and test data from each group

2. Construction of Impression Estimation Models

- Problems with different domains and tasks between source and target

Domain adversarial neural networks (DANN)

Preliminary Experiment

- Source
  - Domain: MNIST
  - Task: Classification from 0 to 9

- Target
  - Domain: MNIST-M
  - Task: Classification from 0 to 9 **(Labels appear at different frequencies)**

**Source Domain ≠ Target Domain
Source Task ≠ Target Task**

Target Accuracy				
Method	Previous research (Ganin et al.)	GitHub (C. Melina)	Kaggle (H. Arai)	This Study
Source Only	0.5225	0.4801	0.5400	----
DANN	0.7666	0.7189	0.9200	0.899

**Confirmed good target accuracy
↓
Proposed DANN model is an appropriate method for our study**

Conclusion

- Proposed impression estimation model for clothing patterns
  - Proposed a transfer learning method, DANN model, that considers various domains

- Preliminary experiment using MNIST data
  - After validating the proposed method, we can assume that DANN is a suitable method

- Future Study
  - Construction of DANN regression model for clothing patterns