# Analyzing the Visual Framing of Migrants Using Deep Learning

Juan Sebastian Olier*[1] and Camilla Spadavecchia†[2]

[1]Department of Cognitive Sciences and Artificial Intelligence, Tilburg University, Tilburg, The Netherlands
[2]Department of Cultural Studies, Tilburg University, Tilburg, The Netherlands

## Coordinators

- Dr. Juan Sebastian Olier
  Tilburg University, Department of Cognitive Science and Artificial Intelligence.
- Dr. Camilla Spadavecchia
  Tilburg University, Department of Cultural Studies.

## 1 Project description

Images represent a key element of media content and influence societal production of meaning, knowledge, and power (Rossi, 2007). The visual portrayal of specific groups in media reinforces stereotypes and narratives that can lead to discriminatory actions and policies (Plous, 2003; Heilman, 2012; Bodenhausen, Macrae, & Sherman, 2016; Verkuyten, Thijs, & Gharaei, 2019; Reny & Manzano, 2016; Kim, Harwood, & Xiang, 2018). That is particularly true for underrepresented or stigmatized groups such as migrants (Suro, Rosenstiel, Kaplan, Dionne, & Akdenizli, 2008; Reny & Manzano, 2016; McIver, 2017; Wenzel & Żerkowska-Balas, 2019).

Studies on migrants' portrayal in media tend to look more at textual than visual representations (Rodriguez & Dimitrova, 2011; Amores, Arcila-Calderón, & González-de Garay, 2020); and focus mainly on refugees and asylum seekers(Olier & Spadavecchia, 2022). For instance, (Tirosh & Klein-Avraham, 2019; Giubilaro, 2019; Wintzer, 2019; Amores & Arcila, 2019) explored how refugees are portrayed in specific media outlets and how that shapes perceptions and political views and attitudes.

In our previous study (Olier & Spadavecchia, 2022), we analyzed the framing of people in migration-related images in ten countries by estimating characteristics such as gender, age, and emotions. Moreover, we looked at the differences emerging when those categories intersect. To that end, we used existing Deep Learningmodels (Karkkainen & Joo, 2021; Toisoul, Kossaifi, Bulat, Tzimiropoulos, & Pantic, 2021) and have found relevant results that lead to a journal paper currently under review.

*j.s.olier@tilburguniversity.edu
†c.spadavecchia@tilburguniversity.edu

However, we have also found that models might have biases arising from the annotation of datasets used to train them. The problem is that with big and "on the wild" datasets, one cannot assume that annotators can always determine labels adequately nor that the categorization process is well defined. For example, in this regard (Scheuerman, Wade, Lustig, & Brubaker, 2020) states that in existing datasets: *"race and gender are portrayed as insignificant, indisputable, and apolitical"*(Scheuerman et al., 2020). Consequently, models are either reproducing biases in society or producing limited results.

Because of these challenges, methods for visual framing analysis based on the classification of people or their characteristics are hard to define in a formal, replaceable, and unbiased way. So, we claim that we should focus on techniques that do not rely on annotation or classification but construct representations only from the visual features in images.

With that in mind, we propose addressing the challenge of automatic visual framing analysis by building models that learn from visual data and do not rely on the explicit classification of people. We argue that pictures contain specific visual features that can be associated with the visual framing used to portray a group (e.g., different framings for "expats" and "refugees"). So, we propose investigating the usage of self-supervised methods to cluster images as a form of visual analysis that is not dependent on external annotations.

This study is interdisciplinary and builds upon our previous project (started from the TSHD Traineeships program 2020-2021 (Olier & Spadavecchia, 2020)). We aim to construct new tools for visual framing analysis that are scalable and overcome the limitations of manual visual content analysis and existing automatic approaches. Moreover, our goal is to explore the application of emerging Deep Learningmethods in new ways relevant to the Artificial Intelligence and the Social Studies communities.

## 1.1 Aim

This study aims to develop and evaluate self-supervised Deep Learningmethods to analyze the visual framing in the portrayal of migrants in visual media content. We want to answer the question:

***To what extent can the analysis of the visual framing of media content portraying migrants be performed using self-supervised Deep Learningmodels?***

## 1.2 Methods

We will address these points:

- Apply self-supervised clustering algorithms to migration-related images.
- Perform manual visual framing analysis on migration-related images.
- Compare the results from image clustering and manual visual analysis.
- Train a model that describes face images from their context.
- Determine the relevance of faces in framing different migrant groups.

We intend to potentiate the analysis of the visual framing of migrant groups in media using Deep Learning. We will contrast the results from trained models with manual visual framing

analysis performed by the DCU coordinator and a DCU trainee. The two processes will be carried out in parallel, and continuous feedback between the two will be central.

We want to address this in two stages. First, establish the extent to which pictures of different migrant groups can be separated with self-supervised methods. The results will be analyzed through a manually performed visual framing analysis. The goals here are to determine similarities between the manual analysis and the automatic clustering and to determine to what extent the clusters generated are related to different kinds of framing.

Second, we want to focus on the facial features emphasized in the visual framing of different groups. In particular, we aim at basing the description of faces not on context-agnostic categorizations but on features that respond to the contextual information given by the images containing such faces. Again, results will be analyzed from a social sciences perspective through manual visual analysis.

Finally, we will reuse the dataset constructed for our previous work (Olier & Spadavecchia, 2022) containing around 18000 images.

#### 1.2.1 Visual framing analysis

We will review the literature on the visual framing of migrants. Then, we will do a visual framing analysis of pictures depicting migrants.

**Visual representation learning** We will implement and train Deep Learningmodels to extract relevant features that allow for clustering and analyzing visual differences between groups using self-supervised representation learning (Tian, Henaff, & van den Oord, 2021; Jing & Tian, 2020).

### 1.3 Trainees collaboration

**DCU trainee:** Student participates in: literature review and visual content and framing analysis of images found on the internet, and connecting those results to those found by the Deep Learningmodels. The student will be trained on how to perform visual framing analysis.

**DCA trainee:** Student participates in: reviewing the literature and implementing DL models for image analysis.

### 1.4 Deliverable

- DL models to extract visual features using self-supervised approaches.
- Visual framing analysis of migration-related images.
- Paper draft for publication.

## 2 Project timeline

The project is divided in stages as described in tables 1 and 2. The project will be carried out mainly during the first semester of the academic year 2022/2023.

| Stage | Task - DCA | Milestones | Months |
|---|---|---|---|
| 1 | Literature review | Review | 1 |
| 2 | Training models | DL models | 3.5 |
| 3 | Results and analysis | Results and conclusions | 0.5 |

Table 1: Project timeline

| Stage | Task - DCU | Milestones | Months |
|---|---|---|---|
| 1 | Literature review | Review | 1 |
| 2 | Visual framing analysis | Framing analysis design + outcomes | 2 |
| 3 | Compare results | Joint results from DL and manual methods | 2 |
| 4 | Concluding work | Conclusions | 0.75 |
| 5 | Write documents drafts | Documents drafts | 0.75 |

Table 2: Project timeline

# 3 Research Trainee Profile

## 3.1 Profile trainee DCA

A student from the department of Cognitive sciences and artificial intelligence, enrolled in either the third year of the CSAI Bachelor, first year of the CSAI Master, or first semester of the DSS Master.

**Tasks the student will participate in:**

- Literature review
- Implement and train self-supervised Deep Learningmodels to extract features from images.
- Writing documents such as reports or papers.

**The candidate should have:**

- Good programming skills in python.
- Machine Learning and Deep Learningknowledge are preferable (either have taken a course on Deep Learning, or is planning to do so during the project).

## 3.2 Profile Trainee DCU

A student from the Department of DCU starting either the third year, starting a Pre Master or a Master.

**Tasks the student will participate in:**

- Literature review and document analysis
- Visual content and framing analysis
- Writing documents

**The candidate should have:**

- Interest in migration studies
- Preferably some previous knowledge on visual framing analysis, and in document analysis.
- Good academic English (both written and spoken)

To apply, a motivation letter should be submitted describing why the candidate is interested on the project, what they expect to get out of it and what is relevant about their background. Additionally a short version of the CV should be attached. Applications should be sent to:

- DCA: J.S.Olier@tilburguniversity.edu
- DCU: C.Spadavecchia@tilburguniversity.edu

## References

Amores, J. J., & Arcila, C. (2019). Deconstructing the symbolic visual frames of refugees and migrants in the main western european media. In *Proceedings of the seventh international conference on technological ecosystems for enhancing multiculturality* (pp. 911–918).

Amores, J. J., Arcila-Calderón, C., & González-de Garay, B. (2020). The gendered representation of refugees using visual frames in the main western european media. *Gender issues*, *37*(4), 291–314.

Bodenhausen, G. V., Macrae, C. N., & Sherman, J. W. (2016). *On the dialectics of discrimination: Dual processes in social stereotyping*. The Guilford Press.

Giubilaro, C. (2019). Regarding the shipwreck of others: for a critical visual topography of mediterranean migration. *cultural geographies*, 1474474019884928.

Heilman, M. E. (2012). Gender stereotypes and workplace bias. *Research in organizational Behavior*, *32*, 113–135.

Jing, L., & Tian, Y. (2020). Self-supervised visual feature learning with deep neural networks: A survey. *IEEE transactions on pattern analysis and machine intelligence*, *43*(11), 4037–4058.

Karkkainen, K., & Joo, J. (2021). Fairface: Face attribute dataset for balanced race, gender, and age for bias measurement and mitigation. In *Proceedings of the ieee/cvf winter conference on applications of computer vision* (pp. 1548–1558).

Kim, C., Harwood, J., & Xiang, J. (2018). The negative and positive influences of threat and nonthreat media messages about immigrants. *International Journal of Communication*, *12*, 23.

McIver, J. (2017). The migrant other: A visual and textual analysis of migration in uk media.

Olier, J. S., & Spadavecchia, C. (2020). Automatic estimation of implicit associations and biases in visual media content portraying migrants. *TSHD Research Traineeships proposal 2020 - 2021*.

Olier, J. S., & Spadavecchia, C. (2022). The visual portrayal of migration: Using ai to analyze the characterization of migrants, refugees, and expats in different countries. *(unpublished)*.

Plous, S. (2003). *The psychology of prejudice, sterotyping, and discrimination: An overview.* McGraw-Hill.

Reny, T., & Manzano, S. (2016). The negative effects of mass media stereotypes of latinos and immigrants. *Media and Minorities*, *4*, 195–212.

Rodriguez, L., & Dimitrova, D. V. (2011). The levels of visual framing. *Journal of visual literacy*, *30*(1), 48–65.

Rossi, L.-M. (2007). Outdoor pornification: Advertising heterosexuality in the streets. In *Pornification* (pp. 127–138). Berg.

Scheuerman, M. K., Wade, K., Lustig, C., & Brubaker, J. R. (2020). How we've taught algorithms to see identity: Constructing race and gender in image databases for facial analysis. *Proceedings of the ACM on Human-Computer Interaction*, *4*(CSCW1), 1–35.

Suro, R., Rosenstiel, T., Kaplan, M., Dionne, E., & Akdenizli, B. (2008). *Democracy in the age of new media: A report on the media and the immigration debate.* The Brookings Institute, The Norman Lear Centre. Carlifornia: University of ....

Tian, Y., Henaff, O. J., & van den Oord, A. (2021). Divide and contrast: Self-supervised learning from uncurated data. In *Proceedings of the ieee/cvf international conference on computer vision* (pp. 10063–10074).

Tirosh, N., & Klein-Avraham, I. (2019). "memorless" the visual framing of asylum seekers in israel. *Journalism Studies*, *20*(3), 381–400.

Toisoul, A., Kossaifi, J., Bulat, A., Tzimiropoulos, G., & Pantic, M. (2021). Estimation of continuous valence and arousal levels from faces in naturalistic conditions. *Nature Machine Intelligence*, *3*(1), 42–50.

Verkuyten, M., Thijs, J., & Gharaei, N. (2019). Discrimination and academic (dis) engagement of ethnic-racial minority students: a social identity threat perspective. *Social Psychology of Education*, *22*(2), 267–290.

Wenzel, M., & Żerkowska-Balas, M. (2019). Framing effect of media portrayal of migrants to the european union: A survey experiment in poland. *East European Politics and Societies*, *33*(1), 44–65.

Wintzer, J. (2019). The visualization of migration. *International journal of qualitative methods*, *18*, 1609406919844100.