The Profiler – Media Education for 10-15 Years Old Pupils Using Image Analysis and an Interdisciplinary Project Approach

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Abstract

According to latest German surveys more than 85% 10 to 15 year-olds own a smartphone. Motivated by the availability of mobile devices with cameras, Internet connectivity and online Social Network Services, they take photos and publish them online. The enabling means have become an integral part of the "digital natives" lives. Their natural media use, though, is opposed to a lack of awareness for possibilities and impacts of image processing, online data exploitation, for potential risks and their responsibility when dealing with photos online.

In this work we present an interdisciplinary project involving a media education approach for children and adolescents of age 10+ using image analysis and new technologies. The Profiler brings together scientists from the fields of Informatics and Sociology as well as teachers and pupils of a secondary academic school. Objectives are to improve their media literacy, to raise awareness for technical possibilities, risks and consequences online and to encourage them in dealing responsibly with their pictures online. This is realized by combining different research and participation methods and by confronting pupils with their picture-based online footprint using a profiling tool integrating state of the art image analysis developed as part of the project. Finally, key findings and lessons learned during this ongoing joint work are presented.

1. Introduction

According to German surveys [1], [2] evaluating the national children's and adolescents' media use almost all (98%) 10 to 15 year-olds have access to smartphones and sharing photos in Social Network Services (SNS) has become an integral part of "digital natives'" lives. The availability of mobile devices and SNSs result in billions of photos being published online, e.g. in Facebook [3]. Teenagers' natural way of using them is opposed them lacking awareness for risks or consequences: Once published, pictures can spread and be processed uncontrollably. There is risk of becoming victims of "cyberbullying" or of "sexting" pictures being shared with the public, which can lead to depression or even suicide [4]. Consequences from not handling data online carefully can be manifold and drastic [5], [6]. Still, they consider their own behavior as unproblematic [7], [8]. Referring to SNSs and legal aspects Buttarelli emphasizes **"**the need to educate children as early as possible about a respectful dealing with information and privacy", their responsibilities and legal rules online [9]. Consequently, educating pupils in media literacy can be a way to empower them with knowledge, skills and competences to responsibly and critically produce, use and reflect media and new technologies

The proposed approach addresses this need and raises awareness among pupils by confronting them with descriptions of themselves created automatically only utilizing image-based content available from them online and state of the art image analysis. For that, a profiling software tool is developed in the project and applied in school workshops. Active participation of the pupils in the two-year project and hands-on experience complement the approach and to encourage them for responsible online behavior through empowerment rather than restriction.

2. Related Work

Mediamanual [10] offers contents and organizes workshops around the topic of "media", a.o. focusing on online personality of Internet users, critical perspectives on virtual identities and behaviors and privacy. **Saferinternet.at** [11] offers free resources including topics such as potential online risks, legal aspects or Internet and sexuality. In contrast to our approach, neither platform uses pupils' own real-world data nor concentrates only on digital images. The German program **"Medienkompetenz macht Schule"** [12] addresses schools and encourages the use of new media by offering teacher trainings, education material and networking possibilities. Same as the Profiler, **Netkompass** [13] and **InMeLi** [14] are Sparkling Science projects, which are funded projects targeted to foster the cooperation between universities and schools. They deal with media use, possibilities and problems in SNSs and follow a similar workstyle of scientists and pupils collaboration. In Netkompass though an information

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platform and information material for adolescents about privacy and data protection in the Social Web are developed. **InMeLi** focuses on critical reflection of pupils' media use and lets them develop a test to evaluate their own Media Habitus. In contrast, this work concentrates on online images and developing and applying a software tool, which confronts them with their own online representation through image analysis.

3. Project Research focus

Sociological research concentrates on researching pupils' Internet behavior and awareness using a mixed methods participatory approach. **Quantitative survey** is implemented as online questionnaire. Based on a workshop with 25 pupils (age ten and fifteen) a draft is developed, tested with five pupils of the same age groups per each and improved concerning language, navigation and completion time. Two questionnaire versions are enrolled to the whole school, a full version (ninth to twelfth grade) and a subset (first to fourth grade). Pupils are supervised by a teacher supporting them in case of questions or navigation difficulties. **Qualitative research** including semi-guided focus groups and interviews complements the quantitative research results to gain deeper insights. All sessions are audio-recorded, transcribed and evaluated following [16]. The guideline is developed based on the questionnaire outcome. Four gender-homogenous group discussions of each 50 minutes with five pupils per group are implemented: one with girls and one with boys of eighth and of tenth grade respectively. Individual interviews are conducted with each four girls and four boys from eight school year as well as from tenth school year.

From the computer science perspective, research on facial and affective image analysis within the context of large amounts of unconstrained image data is conducted. State of the art open-source algorithms such as described in [17] are evaluated and optimized concerning their application in a software tool for minors as target users.

4. Pupils' participation

Pupils participate actively in all project phases and involved field. They collaborate with scientists, in e.g. the development of questionnaires, user requirement analysis, interface design, user testing and software evaluation. They document and present their findings and critically reflect and discuss with peers, teachers and researchers.

Workshops and excursions cover context-related topics, such as image processing, legal aspects, privacy, online risks, research methods or user testing as well as ongoing research projects. Exercises to test and apply the developed tool are conducted. They not only aim at two-way knowledge and experience transfer and generating project results, but also at providing pupils with first-hand knowledge and open space for discussions.

Following, three examples for workshops are briefly described:

- *Scientific Research:* The workshop introduces pupils into quantitative scientific research. After an overview over the development of questionnaires, pupils work in groups and develop questionnaire questions relevant for them to research their peers' Internet use and experience. These are considered for the sociological research.
- *My picture online:* In the practical workshop pupils work in pairs on the task of manually evaluating their own online representation by searching from themselves using search engines and SNSs. Hence, they imitate manually, what the Profiler tool does automatically, reflect and discuss personal data, possible conclusions and compare the retrieved results.
- *The profiler user testing*: In groups of five the pupils use the profiler tool without prior introduction and fill out a user test questionnaire assessing usability, analysis accuracy and subjective performance aspects. Wurstify servers as example for demonstration and discussion how easily images can be manipulated automatically, not only for criminal or dangerous purposes.
- *Parents' information events*: Two events are organized for parents to inform them about the projects, results and key findings including also Q&A sessions with teachers, head of school and involved researchers.

5. The Profiler Tool

Awareness is raised through confronting pupils with their online representation using a software tool developed during the project and applied in school workshops. It describes persons only based on content analysis and synthesis of personal pictures acquired from online resources. The workflow of the tool comprises the following steps:

1. Image Acquisition: Personal images are simply and automatically downloaded from Facebook, Twitter, Instagram and Google Image Search followed by preprocessing steps to optimize the subsequent analysis and a face detection.
2. Image Analysis & Profiling: On all detected faces a comprehensive image analysis is performed, including gender classification, age estimation, emotion recognition and a face similarity calculation to recognize the target person. This is followed by a results synthesis to describe the subject.
3. Profile Visualization and Reporting: The results (age, gender and emotion) of every detected face showing the target person as well as the corresponding averages are visualized on every picture (Figure 1). In addition, Wurstify [15], a plug-in adding beards to detected faces is integrated as an example for image manipulation (Figure 2). A one-page report can be downloaded as PDF (Figure 3)

The Profiler user interface is browser-based and age-appropriately designed with visualizations, animations and explanations for every step to make the underlying processes visible and understandable.

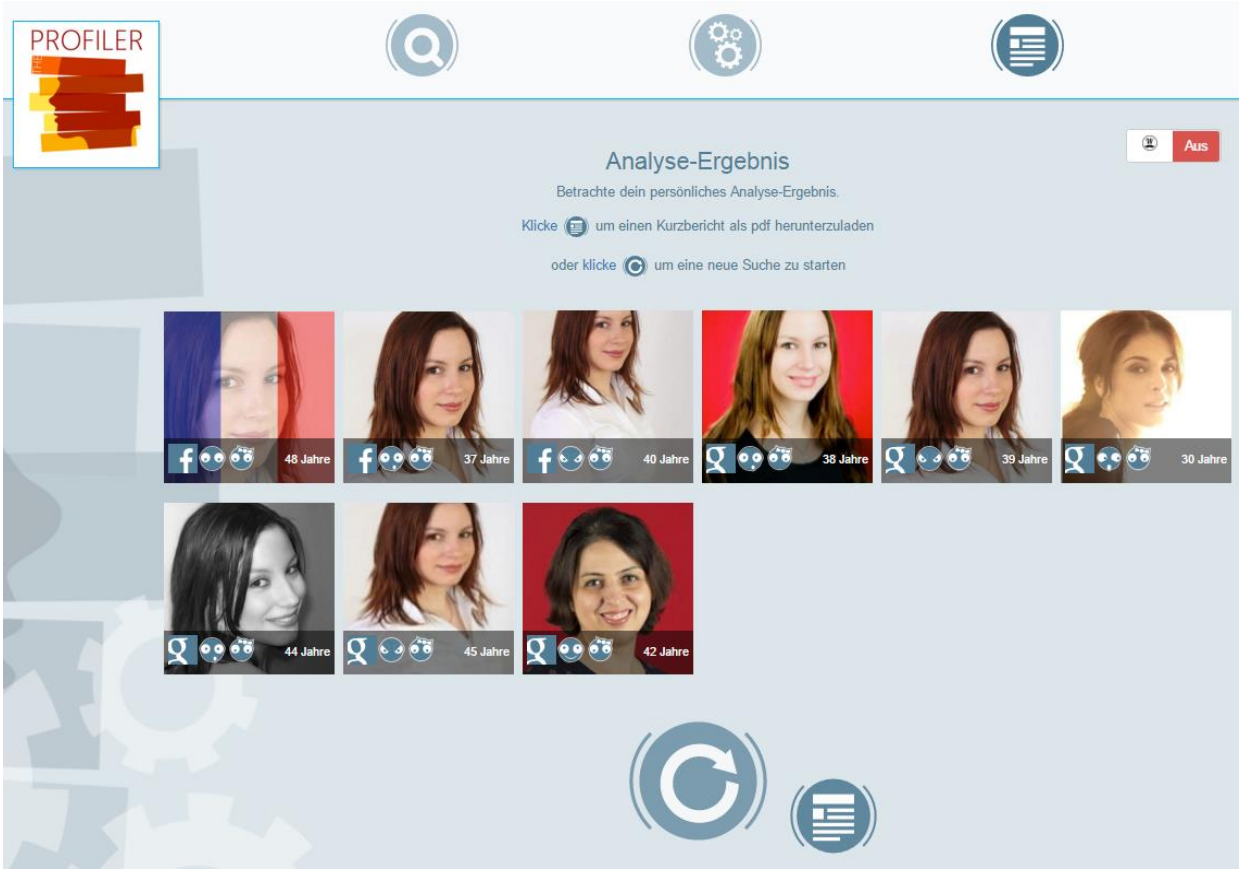

Figure 1: Image analysis results visualization with the author as profiling subject

Figure 2: Image analysis results without (l) and with (r) “Wurstification”

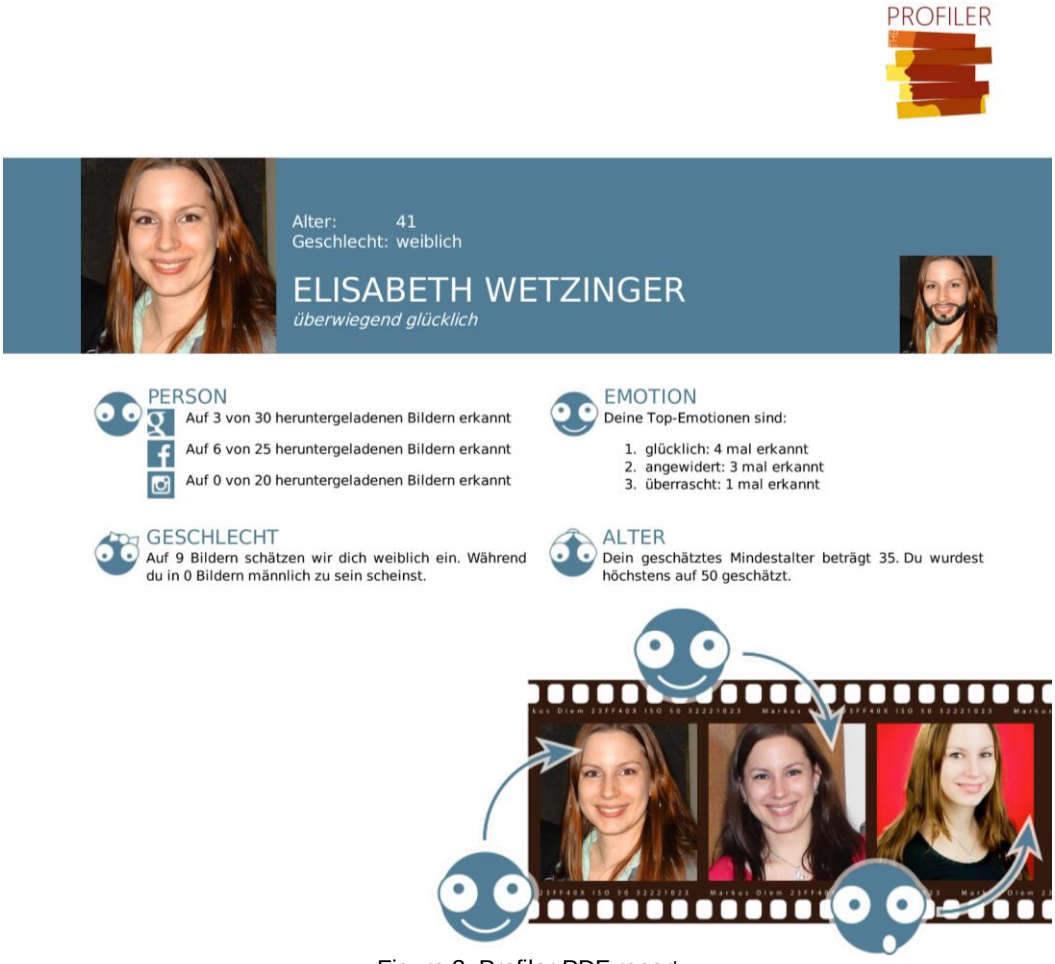

Figure 3: Profiler PDF report

6. Key findings & lessons learned

953 pupils of GRG23 Draschestraße Vienna completed the online questionnaire. The results concerning Internet use, online activities and risks are similar as in [1], [2]. 95% own a smartphone and >50% spend more than two hours online per day. Online communication and sharing pictures are substantial activities done mainly using Instagram, Facebook, Whatsapp or Snapchat. Pupils are careful when it comes to adding new contacts to their network or sharing personal images, but less aware about information shared with platform providers. Though having knowledge about security settings, data protection and copyright, they lack in implementing it consequently, e.g. by regularly updating the security settings of their SNS accounts.

One lesson learned is that close collaboration with teachers already during project planning is essential for the project success, e.g. to consider aspects referring to computer-skills, didactics and organizational tasks appropriately. Collaborating with adolescents and integrating sociological research to the project created unique benefits and synergies for the Profiler software design and development, e.g. identification of relevant SNS, usability requirements as well as which personal characteristics are of interest to be included in the created profiles. On the other hand, pupils benefit as they gain insights into state of the art research, first-hand information and answers to their questions from scientists to topics relevant for their everyday lives and their future. In addition, they learn and apply scientific work methodologies and experience technical possibilities of semi-automatic image acquisition, processing and analysis on their own online data. Teacher and pupil feedback shows that awareness has been raised for critical aspects of images in SNS and the Internet. Survey results confirm the project approach teaching through hands-on experience being an effective and sustainable way towards a more critical and responsible Internet use behavior.

7. Conclusion

In this paper we presented an interdisciplinary project approach to raise awareness among pupils of age 10-15 for possibilities and risks of handling personal pictures online. Research focuses on their

Internet use behavior and on facial image analysis applied to large datasets of unconstrained datasets. A software tool to describe persons only based on content-based analysis of online images is developed and used. Future work includes optimizing image analysis accuracy and decreasing computation times. Workshops within the project context and use of the Profiler tool will be firmly established in school lessons. Finally, it is planned to make the Profiler available for other schools.

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References

[1] S. Feierabend, S., Plankenhorn, T., Rathgeb, T. "KIM-Studie 2014," Stuttgart, Medienpädagogischer Forschungsverbund Südwest, 2015.
[2] Rathgeb,T., Plankenhorn, T., Feierabend, S. "JIM-Studie 2015," Stuttgart, Medienpädagogischer Forschungsverbund Südwest, 2015.
[3] Facebook Inc., "facebook Annual Report 2014," Menlo Park, 2015.
[4] Schuster, M. "Cybermobbing – Mobbing im virtuellen Raum Jugendliche als Opfer und TäterInnen, eine qualitative Untersuchung," Vienna University, 2011.
[5] Sacco, D., Argudin, R., Maguire, J., Tallon, K., "Sexting: Youth Practices and Legal Implications," SSRN Electron. J., vol. 7641, 2010.
[6] van Geel, M., Vedder, P., Tanilon, J. "Relationship between Peer Victimization, Cyberbullying, and Suicide in Children and Adolescents: A Meta-analysis.," JAMA Pediatr., 2014, pp. 1–8.
[7] Lievens, E. "Bullying and sexting in social networks: Protecting minors from criminal acts or empowering minors to cope with risky behaviour?," Int. J. Law, Crime Justice, vol. 42, no. 3, 2014, pp. 251–270.
[8] Staksrud, E., Lobe B. "Evaluation of the Implementation of the Safer Social Networking Principles for the EU Part I : General Report," Sites J. 20Th Century Contemp. French Stud, 2010
[9] Buttarelli, G. "Data protection legislation in Europe, preventing cyberharassment by protecting personal data and privacy," in Cyber-Harassment Closing Conference - Teacher Union strategies on Cyber-Harassment, June, 2010.
[10] Federal Ministry for Education and Women, "Mediamanual," http://www.mediamanual.at. [Accessed: 04-Feb-2016].
[11] Bernhard, J. "Saferinternet.at," 2016. https://www.saferinternet.at [Accessed: 04-Feb-2016].
[12] Lonz, G. "Medienkompetenz macht Schule," http://medienkompetenz.bildung-rp.de [Accessed: 04-Feb-2016].
[13] FH OÖ Forschungs- & Entwicklungs GmbH, "Netkompass," http://www.netkompass.at/info/ [Accessed: 04-Feb-2016].
[14] Mildner, K "InMeLi" http://podcampus.phwien.ac.at/inmeli/ [Accessed: 04-Feb-2016].
[15] Grössing, B., Fankhauser, D. "Wurstify," https://wurstify.me/ [Accessed: 04-Feb-2016].
[16] Mayring, P. "Qualitative Inhaltsanalyse: Grundlagen und Techniken", Beltz, 11., revis. Weinheim, 2010.
[17] Atanasov, M. "Person Profiling Using Individual-Related Image Analysis", Bachelor Thesis, Vienna University of Technology, 2015