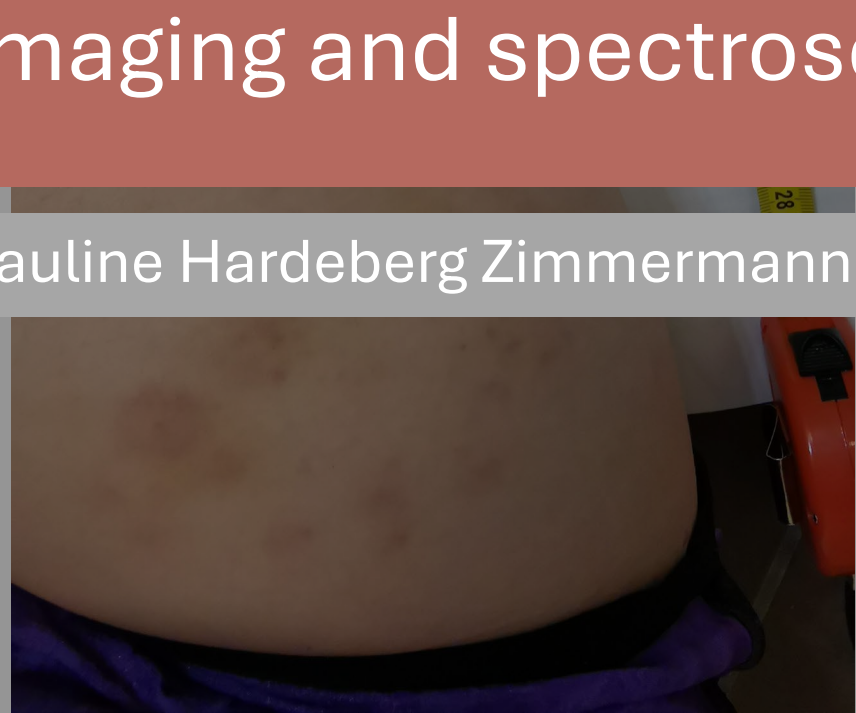


Documenting bruises with imaging and spectroscopy

Pauline Hardeberg Zimmermann, NTNU





Why bruises?

Methods

Discussion



Which bruise is older?



Why bruises?

Methods

Discussion




Bruises on children





Analyze bruises



A photograph of a woman with dark hair hugging a young child with curly blonde hair from behind. They are sitting on a sandy beach, and the background shows a calm sea and a soft, hazy sunset sky. The image has a warm, golden-hour color palette. The word "Consequences" is overlaid in white text in the center.

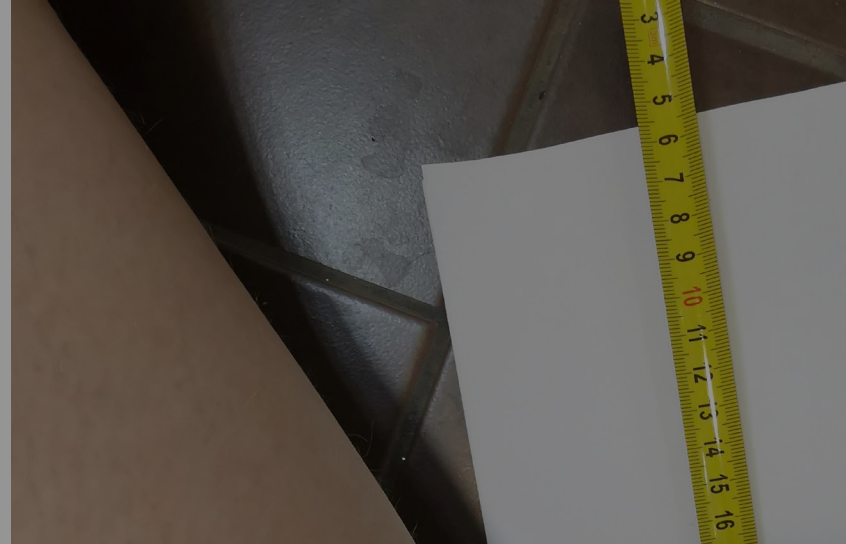
Consequences



Why bruises?

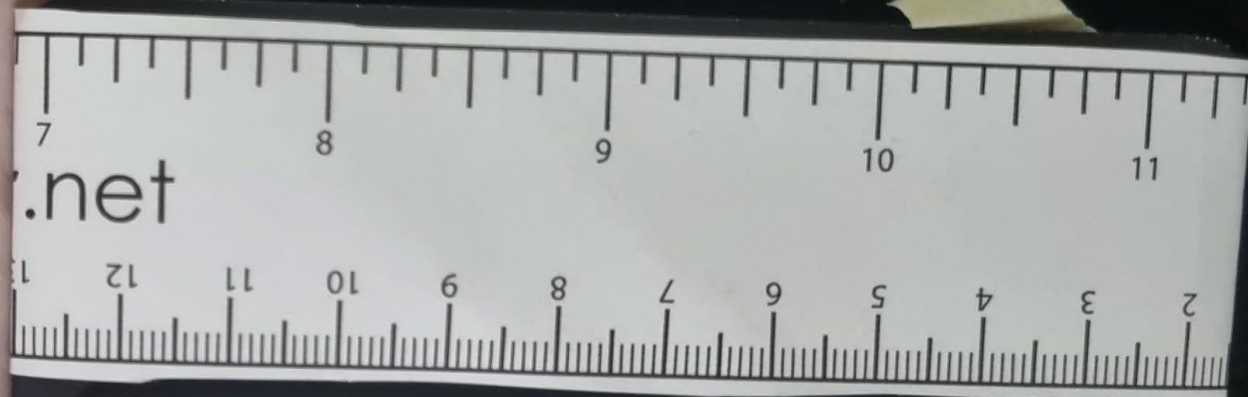
Methods

Discussion

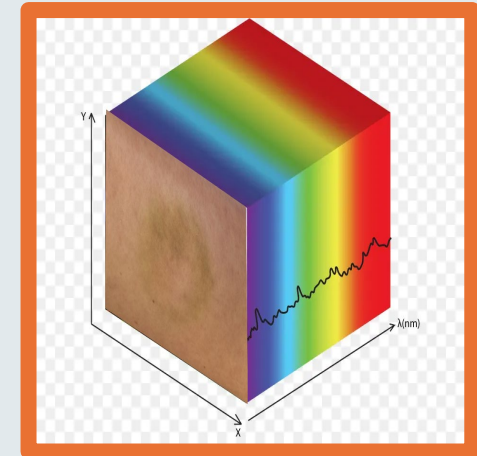
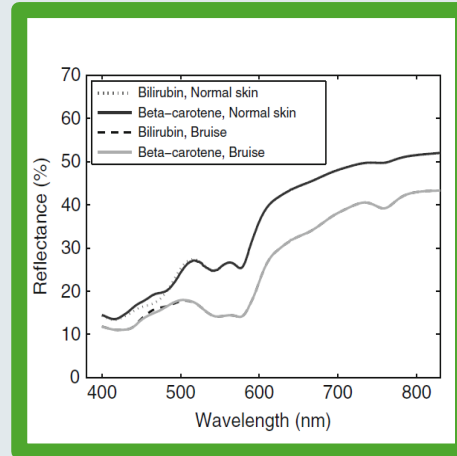
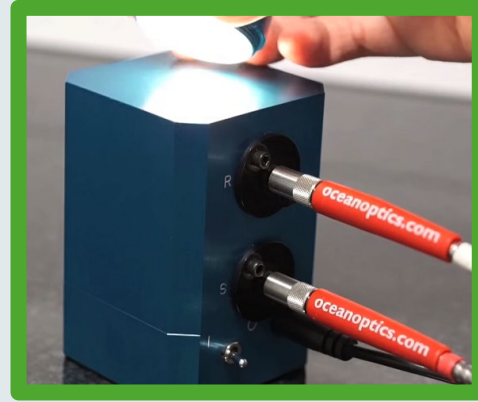


When and how was the bruise created?





Documenting bruises
of known origin with
three methods

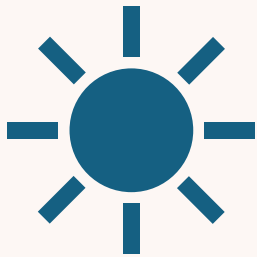


CONVENTIONAL
IMAGING

SPECTROSCOPY

HYPERSPSCTRAL
IMAGING

Project timeline



SPIE Photonics West
2025



Supervising Master
thesis 2024-25



PhD defense 2025

Photo: Unsplash.com



Gather data

Accidental bruises from sports

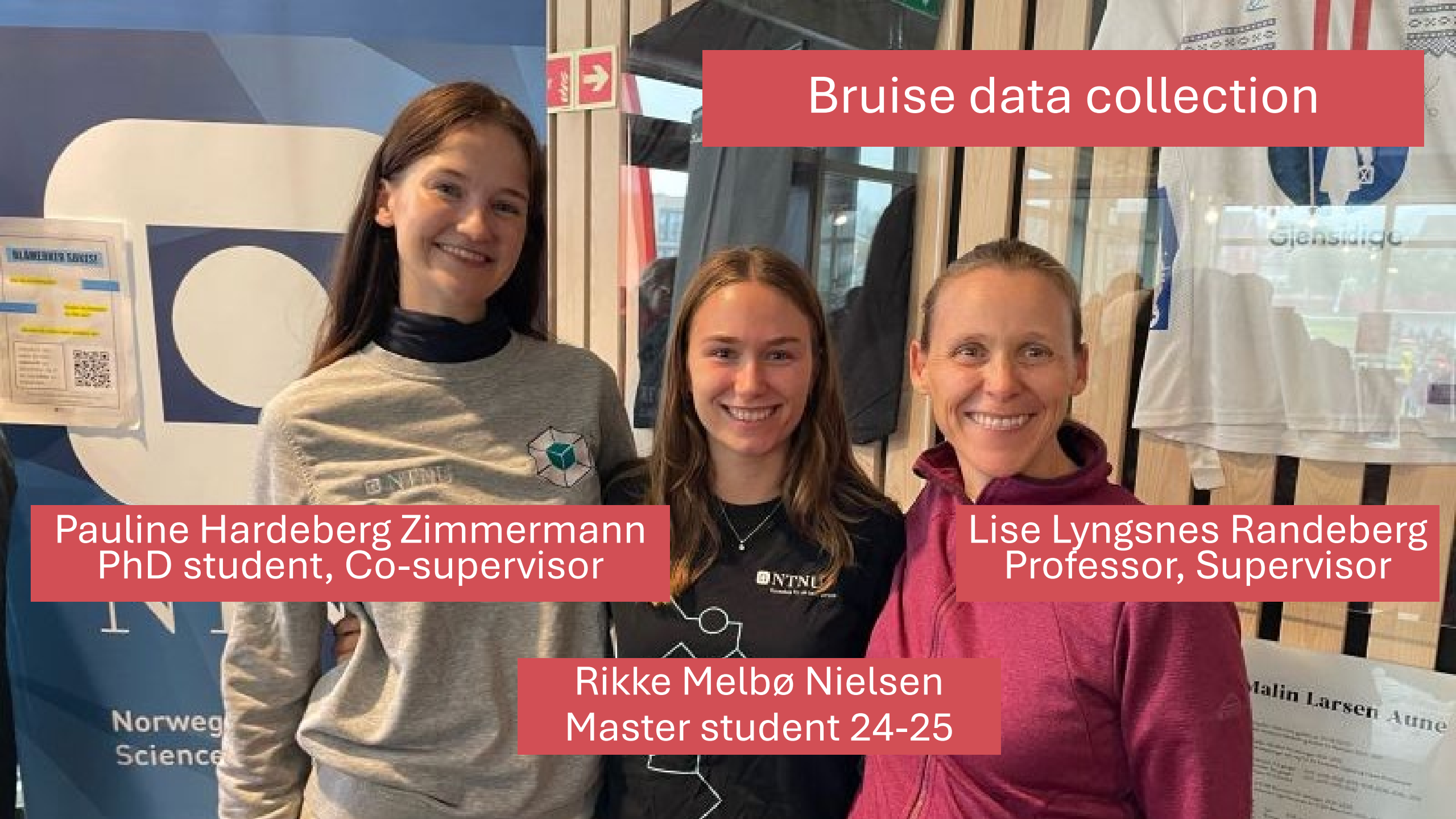


Bruise data collection

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Professor, Supervisor

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Why burises

Methods

Discussion

Discussion

- Participants born between 1974 and 2013
- Good gender balance
- **Challenges:** technical, ethical, data quality



Technical challenges

- Long capture time on hyperspectral camera
- Uncontrolled lighting conditions
- Gloss and shadows
- Different skin tones and complexions
- Controlling distance

Ethical challenges

- Research on children
- Cannot pay people to participate
- Bruises from abuse



Data quality challenges

- Uncertain bruise origin
- Difficulty acquiring follow-up sessions

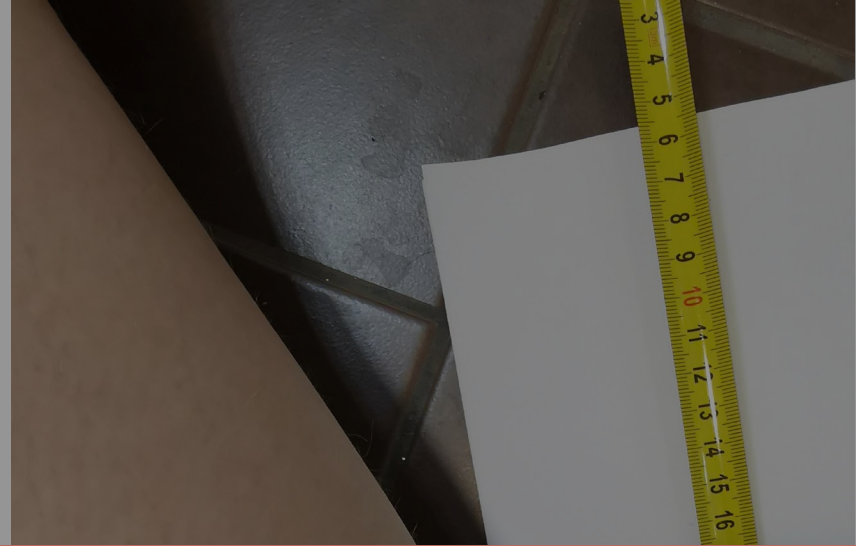


A woman with long brown hair, wearing a black t-shirt with a green geometric logo, stands on a sandy beach. She is smiling and looking towards the ocean. The background shows a sunset over the ocean with a sky filled with soft, colorful clouds. Two teal speech bubbles with black outlines are overlaid on the image. The first bubble is positioned above the woman's head and contains the text 'Thank you!'. The second bubble is positioned to the right of the woman and contains the text 'Questions or bruises?' followed by the email address 'Pauline.hardeberg@ntnu.no' on two lines.

Thank you!

Questions or
bruises?

[Pauline.hardeberg](mailto:Pauline.hardeberg@ntnu.no)
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