Insight Into Lumbar Back Pain
What the Lumbar Spine Tells About Your Life

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Keywords: My Keywords in Title Case

Abstract: The abstract should summarize the contents of the paper and should contain at least 70 and at most 200 words. The text must be set to 9-point font size.

1   INTRODUCTION

Epidemiology is the study of causation of diseases. Large population studies, such as the Study of Health in Pomerania (SHIP) **??** gather as much information as possible about participants to be assessed towards different diseases. These information are used to determine risk factors for diseases, helping people to make their lifestyle healthier or helping in diagnosing a disease. Epidemiological research is strongly hypothesis driven. Observations made by clinicians are translated into hypothesis, which are then statistically evaluated using data variables from epidemiological studies.

Modern cohort studies often comprise medical image data. These data are hard to analyze, since segmentation algorithms are not generally available and need to be custom-made for each body structure. Segmentation data it is usually analyzed by abstracting it into key figures, making it statistically comparable to non-image variables and retrieve correlations.

Back pain is one of the most frequent diseases in the western civilization.

Our goal is to combine data mining algorithm with data visualization to provide insight into the quality of image derived data to analyze if it acts as a risk factor for a disease.

More than 5 variables are rarely analyzed simultaneously. Our contributions are:

- Analyzing back pain using image-derived variables of 2,240 subjects.

- Assessing the suitability of lumbar spine shape for diagnosing back pain

- Analyzing correlations between between image-based and socio-demographic as well as medical parameters.

- Identification of most important variables using data mining methods noch schoen schreiben

- semiquantitative Auswertmglichkeiten werden dem User oft zur verfgung gestellt

- Techniken sind als Teil des IVA-Frameworkes zu verstehen

2   EPIDEMIOLOGICAL BACKGROUND

?? Background. Epidemiological Workflow, focus on statistical resilience, image data hard to analyze due to the large amount of subjects, poor image quality and lack of methods.

2.1   Back Pain

Back pain one of the most common diseases in the western civilization; hard to analyze; Epidemiologists interested in the *healthy* aging process.

Risk factors for are not completely known, thus epidemiologists search for new correlations in cohort studies.

3   RELATED WORK

Our own work (VIS, VMV, BVM). Sylvias paper with reference to the methods.
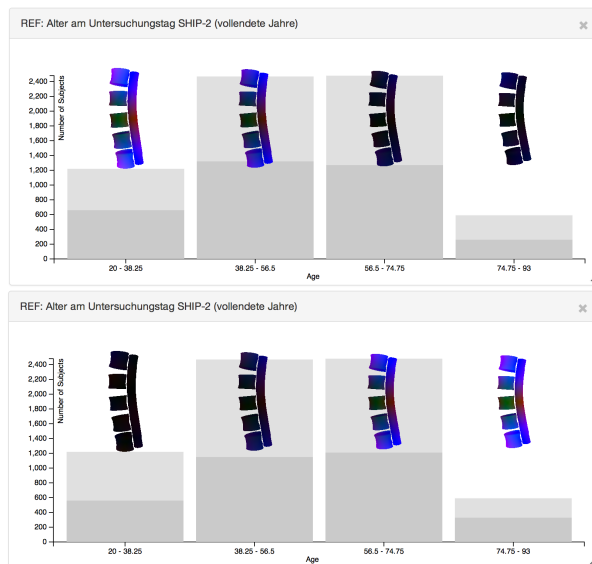
4 The Lumbar Spine Data Set

Figure 1: Age-Gender

Our data set compiled to analyze lumbar back pain comprises of 6,753 subjects from two cohorts (4,420 from SHIP-Trend-0 and 2,333 from SHIP-2).

4.1 Non-Image Data

Analysis Using Heterogeneous Correlation The variables range from somatometric variables describing body measures to medical examinations, such as laboratory tests as well as lifestyle factors as sport activity or nutrition.

Es wurde mit einem weiten Spektrum Daten gesammelt, vom denen man glaubt, dass sie irgendwas mit der Wirbelsulenverformung und dem Alterungsprozess zu tun haben. It is an active research area to determine these correlations.

4.2 Image Data

From VIS'14 Paper The lumbar spine was detected in the image data using a hierarchical finite element method by Rak et al. [32]. This semiautomatic method requires the user to initialize the tetrahedron-based finite element models (FEM) with a click on the L3 vertebra. Two user-defined landmarks on the top and bottom of the L3 vertebra describe an initial model height estimation. The model uses a weighted sum of T1and T2-weighted MR images to detect the lumbar spine shape. Once registered, it captures information about the shape of the lumbar spine canal as well as the position of the L1-L5 vertebrae [21]. Due to incorrect initialization, strongly deformed spines, contrast differences and artifacts, the model was not able to detect lumbar spines for all subjects. We obtained and worked with 2,540 tetrahedron models of the lumbar spine. For clustering, we extracted the centerline of the lumbar spine canal, which captures information about lordosis and scoliosis (the medical terms for spine curvature) [21].

5 EXPERIMENTS

5.1 Preliminary Results

- Direkter Vergleich
- Verteilung des Means
- Korrelationsmatrix
- PCA

Weil das nicht ausreichend war, haben wir einen C5.0 Baum erstellt, um alle potentiellen Zusammenhnge zwischen bildbezogenen und Nichtbildbezogenen Parametern herzustellen - Was kann man mit den Bilddaten erklren und was nicht?

5.2 Experimental Settings and Results

Decision Tree erklaeren, ebenfalls Umrechnen in die Dummy-Variablen. Was sind die Zielvariablen

- Altersgruppierung
- Male/Female
- Gewicht (BMI - dnn, normal, dick)

6 EVALUATION OF DECISION TREES

- Vorgehen mit Scatterplot erklren
- Beschreiben der Ergebnisse
- Beschreiben des interaktiven Systems zum Anzeigen der Decision Trees

We can discriminate back pain using non-image data, but not with image-derived parameter Welche parameter knnen wir gut unterscheiden

7 CONCLUSION

ACKNOWLEDGEMENTS

REFERENCES

APPENDIX

If any, the appendix should appear directly after the references without numbering, and not on a new page. To do so please use the following command: $\backslash section\text{*}\{APPENDIX\}$