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Markov model of cancer development – survival time prediction

We will present a newly developed [1] Markov model of cancer development. This is a compartmental model which allows one to separately consider different stages of the disease's progress. The model assumes that the distribution of waiting times between stages is exponential with the rate depending linearly on an arbitrary number of predictors. We apply this model to a breast cancer data set of women from the Pomerania region (1987–1992) [2]. We use the medical data in conjunction with a modified Bloom grading system to assign patients to different states of the Markov chain and explore what clinical predictors (which include amongst others age, tumour size, number of infected nodes, presence of estrogen and proestrogen receptors) best describe the state dependent transition probabilities and whether they have detrimental effects via a regression analysis. We also explore the possibility of survival time prediction under this Markov model of disease and consider extensions of the assumption of exponentially distributed waiting times.

References

[1] D. Faissol et. al. *Bias in Markov models of disease* Mathematical Biosciences **220** 143–156.

[2] J. Skokowski *Wartości rokownicze wybranych czynników klinicznych i patomorfologicznych w raku piersi* PhD thesis Medical University of Gdańsk **2001**.