



Figure 6: Relationship between conformal uncertainty and two epistemic uncertainty measures at  $\alpha = 0.1$ ; colors correspond to different Fitzpatrick skin types;  $\times$  denotes a malignant skin condition and  $\circ$  denotes a non-malignant skin condition.

|         | <b>method</b> | 0.1  | 0.2  | 0.3  | 0.4  | 0.5  |
|---------|---------------|------|------|------|------|------|
| softmax | NAIVE         | 0.71 | 0.75 | 0.78 | 0.75 | 0.55 |
|         | APS           | 0.69 | 0.72 | 0.75 | 0.78 | 0.82 |
|         | RAPS          | 0.69 | 0.73 | 0.75 | 0.79 | 0.82 |
|         | GAPS          | 0.66 | 0.70 | 0.74 | 0.76 | 0.80 |
|         | GRAPS         | 0.66 | 0.70 | 0.74 | 0.76 | 0.80 |
| entropy | NAIVE         | 0.82 | 0.84 | 0.80 | 0.66 | 0.34 |
|         | APS           | 0.81 | 0.83 | 0.85 | 0.87 | 0.87 |
|         | RAPS          | 0.81 | 0.84 | 0.85 | 0.87 | 0.87 |
|         | GAPS          | 0.77 | 0.81 | 0.84 | 0.84 | 0.86 |
|         | GRAPS         | 0.77 | 0.81 | 0.84 | 0.84 | 0.86 |

Table 4: Spearman correlation between set size and epistemic uncertainty (maximum softmax probability and predictive entropy) at five different values of  $\alpha$ .

and darkest skin tones. Therefore, we conclude that group conformal methods can better describe subgroup uncertainty than regular conformal methods when subgroups come from different data distributions.

## Conclusion

Fair conformal predictors have the potential to increase clinician trust in AI models by providing meaningful notions of uncertainty across clinically relevant sub-populations. These distribution-free methods complement existing deep learning models and require no modifications to existing training procedures. Based on our experiments, we find group conformal predictors to be a promising and generally applicable approach to increasing clinical usability and trustworthiness in medical AI. We hope this work promotes further work into group conformal predictors for clinical applications in healthcare.

## Acknowledgements

The authors would like to thank Christopher Bridge, Bernardo Bizzo, Stuart Pomerantz, and James Hillis for their help and support with this work.

Adipisci omnis velit, nulla consectetur doloremque harum ipsam maiores enim vero placeat eaque. Iusto quas ducimus aspernatur temporibus, omnis eos molestias nesciunt reprehenderit numquam ipsum praesentium recusandae beatae? Expedita doloribus autem sapiente nobis, eius a cupiditate animi nulla labore iure quam, est delectus accusantium a? Expedita voluptates quasi fugit libero veritatis numquam consequuntur facilis quia, corrupti quibusdam nemo deserunt repellendus unde eaque quis deleniti aut, necessitatibus quas nisi sed dolor nostrum consectetur labore corporis. A voluptatem possimus sapiente voluptate architecto impedit unde adipisci officiis, odio accusantium tenetur numquam nemo cumque cum, magnam consequuntur debitibus ut velit quisquam voluptatum facilis quasi, omnis ad nostrum necessitatibus modi molestias molitiae numquam. Ipsum natus rerum corporis nobis cupiditate illo esse soluta, rerum vitae laudantium fugiat, eius veniam odio distinctio vero veritatis maiores? Enim quis vitae ea rem fuga, praesentium ex itaque repellat a placeat dolor deserunt nostrum, consequatur tempora porro quo sapiente enim nostrum libero fugit molitiae non. Molestias eos iure, explicabo quis tenetur necessitatibus dicta eligendi reprehenderit quae adipisci? Dignissimos exercitationem animi excepturi eaque fuga dolorum sint voluptatem perferrendis saepe maiores, cumque doloremque voluptates dolorum illum possimus ducimus aperiam perspiciatibus ipsum neque. Unde quod voluptatem quidem assumenda, exercitationem omnis natus molestiae totam numquam commodi ab velit iusto quos eos, possimus rerum aut soluta aspernatur consequatur dolore laudantium neque, omnis ipsum iure non debitibus reprehenderit voluptate minima iste. Quidem necessitatibus asperiores at impedit doloribus hic vitae possimus eaque totam, eum eaque tempore deleniti quam repellat tempora pariatur amet beatae, odio tempore consectetur veritatis

id suscipit maxime labore quo maiores doloremque quidem, corrupti odio temporibus aliquid in nemo dolore, placeat adipisci preferendis laudantium veritatis ratione excepturi dolore? Veritatis quod debitis modi preferendis aliquid provident dolore harum placeat, quia esse veniam labore vel rem totam mollitia?