

# Machine-Learning Based Routing of Callers in an Israeli Mental Health Hotline

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## Abstract

**Background:** Mental health contact centers (also known as Hotlines) offer crisis intervention and counselling by phone calls and online chats. These mental health helplines have shown great success in improving the mental state of the callers, and are increasingly becoming popular in Israel and worldwide. Unfortunately, our knowledge about how to conduct successful routing of callers to counselling agents has been limited due to lack of large-scale data with labeled outcomes of the interactions. To date, many of these call centers are overwhelmed by chat requests and operate in a simple first-come-first-serve (FCFS) scheduling policy which, combined, may lead to many callers receiving suboptimal counselling or abandoning the service before being treated.

**Methods:** We present a large-scale machine learning-based analysis of real-world data from the online chat center of the Israeli Association for Emotional First Aid (Eran). The data includes over 30,000 conversations over a 18-month period. Through our analysis, we identify indicative features that significantly contribute to the effectiveness of calls, demonstrate high accuracy in predicting the expected duration of chats both a priori and during the chat itself and estimate the expected acceptable waiting time of callers. Based on these findings, we demonstrate how online scheduling techniques, which consider our results, can bring about a significant advantage over existing practices.

**Results:** We created 100 simulations of standard and heavy call flow scenarios and evaluated our proposed solution. We found that our solution can significantly outperform the FCFS policy in both types of scenarios. Specifically in the heavy call flow scenarios, our proposed

solution is expected to improved the average quality of conversation by 24% and increased the number of served called by 3%.

**Conclusion:** The implemented routing policy in MHCCs can significantly effect their performance. Leveraging artificial intelligence techniques, such as machine learning algorithms, combined with real-world data can bring about a significant and necessary leap forward in the way MHCCs operate.