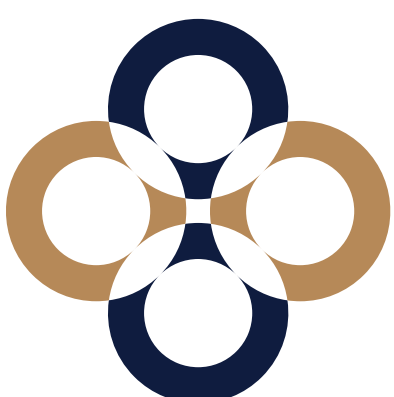
**Author(s):****Johannes, WACHS****Organisational unit:** Institute of Data Analytics and Information Systems**Title:** Digital traces of brain drain: developers during the Russian invasion of Ukraine**Publication data:** EPJ DATA SCIENCE, 2023**Journal ranking:** SJR 2022: Q1, Alp 2021: 93**Abstract:**

The Russian invasion of Ukraine has caused large scale destruction, significant loss of life, and the displacement of millions of people. Besides those fleeing direct conflict in Ukraine, many individuals in Russia are also thought to have moved to third countries. In particular the exodus of skilled human capital, sometimes called brain drain, out of Russia may have a significant effect on the course of the war and the Russian economy in the long run. Yet quantifying brain drain, especially during crisis situations is generally difficult. This hinders our ability to understand its drivers and to anticipate its consequences. To address this gap, I draw on and extend a large scale dataset of the locations of highly active software developers collected in February 2021, one year before the invasion. Revisiting those developers that had been located in Russia in 2021, I confirm an ongoing exodus of developers from Russia in snapshots taken in June and November 2022. By November 11.1% of Russian developers list a new country, compared with 2.8% of developers from comparable countries in the region but not directly involved in the conflict. 13.2% of Russian developers have obscured their location (vs. 2.4% in the comparison set). Developers leaving Russia were significantly more active and central in the collaboration network than those who remain. This suggests that many of the most important developers have already left Russia. In some receiving countries the number of arrivals is significant: I estimate an increase in the number of local software developers of 42% in Armenia, 60% in Cyprus and 94% in Georgia.

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