US 20230231575A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0231575 A1**

Kliewer et al. (43) **Pub. Date: Jul. 20, 2023**

(54) **SYSTEMS AND METHODS FOR DECODING OF GRAPH-BASED CHANNEL CODES VIA REINFORCEMENT LEARNING**

(71) Applicant: **New Jersey Institute of Technology**, Newark, NJ (US)

(72) Inventors: **Joerg Kliewer**, Fair Lawn, NJ (US); **Allison Beemer**, Eau Claire, WI (US); **Salman Habib**, Newark, NJ (US)

(73) Assignee: **New Jersey Institute of Technology**, Newark, NJ (US)

(21) Appl. No.: **17/954,120**

(22) Filed: **Sep. 27, 2022**

Related U.S. Application Data

(60) Provisional application No. 63/249,412, filed on Sep. 28, 2021.

Publication Classification

(51) **Int. Cl.**
H03M 13/11 (2006.01)

(52) **U.S. Cl.**
CPC ***H03M 13/1131*** (2013.01); ***H03M 13/1125*** (2013.01); ***H03M 13/1128*** (2013.01)

(57) **ABSTRACT**

Embodiments of the present disclosure relate to sequential decoding of moderate length low-density parity-check (LDPC) codes via reinforcement learning (RL). The sequential decoding scheme is modeled as a Markov decision process (MDP), and an optimized cluster scheduling policy is subsequently obtained via RL. A software agent is trained to schedule all check nodes (CNs) in a cluster, and all clusters in every iteration. A new RL state space model is provided that enables the RL-based decoder to be suitable for longer LDPC codes.