

CACHE-AIDED COOPERATION WITH NO CSIT

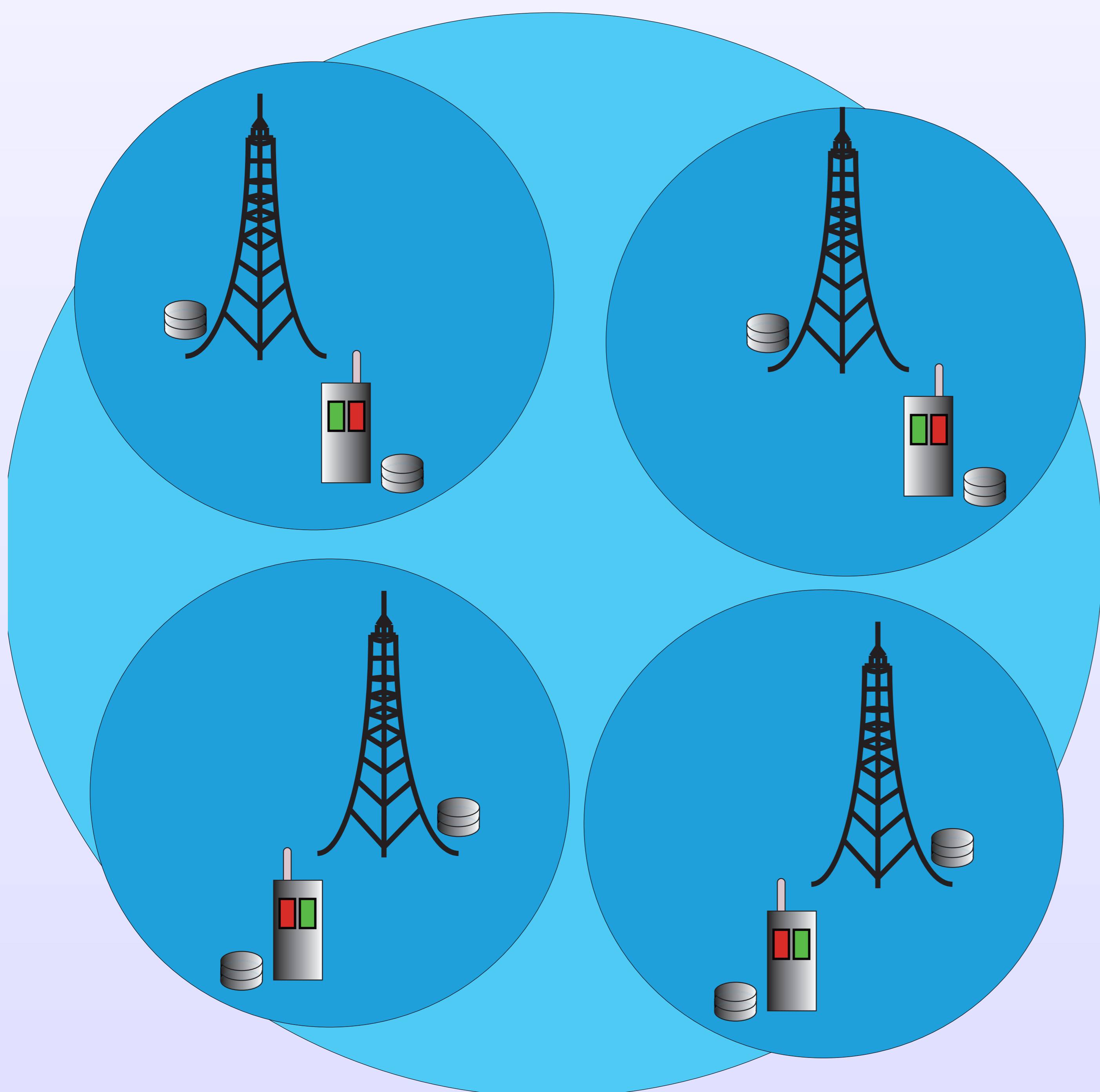


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Assumptions

- **No backhaul** during content delivery
- **Topology:** Weak and Strong Interference
- **No CSIT:** Blindly Harness Topology
- **Content:** Partially close, partially far



Key Questions

- What's the role of **Tx Caching**?
 - Content Closer, Cooperation, Boost Rx caching
- What's the role of **Rx Caching**?
 - Use unwanted movies to remove interference
- **Topology** : Friend or Foe?
 - Interference Enhancement

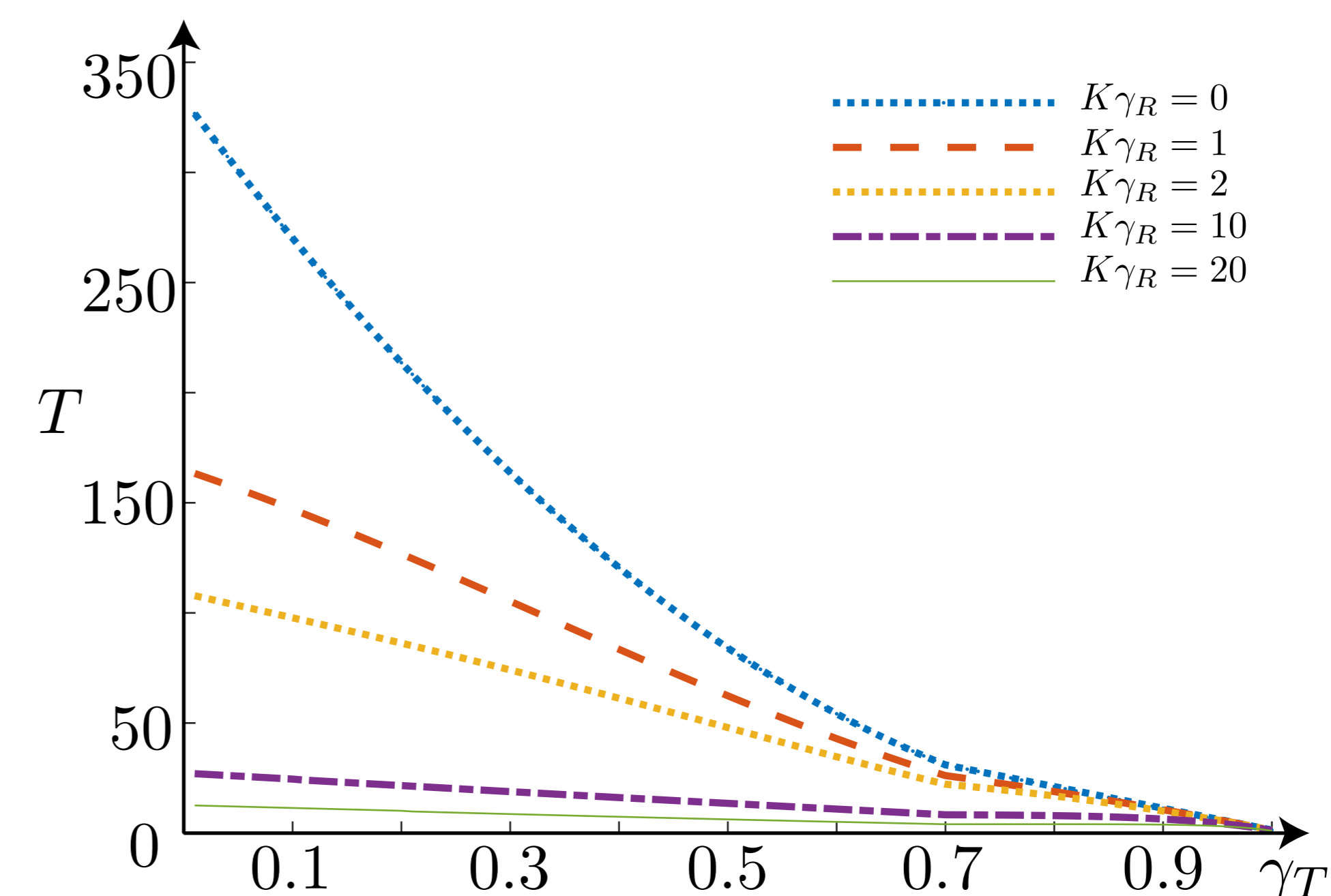
Result

$$\mathcal{T}(\gamma_T, \gamma_R) = \frac{K\gamma_T(1-\gamma_R)}{K(1-\tau) + (K\gamma_R+1) \left(\min\left\{\frac{2\tau-1}{1-\gamma_T}, \tau\right\} \right)^+} + \frac{K(1-\gamma_T)(1-\gamma_R)}{K_g \min\left\{\frac{\tau}{1-\gamma_T}, 1\right\}} x_s$$

- **Transmitter Side Caching**
- **Interference Enhancement**
- **Coded Caching**

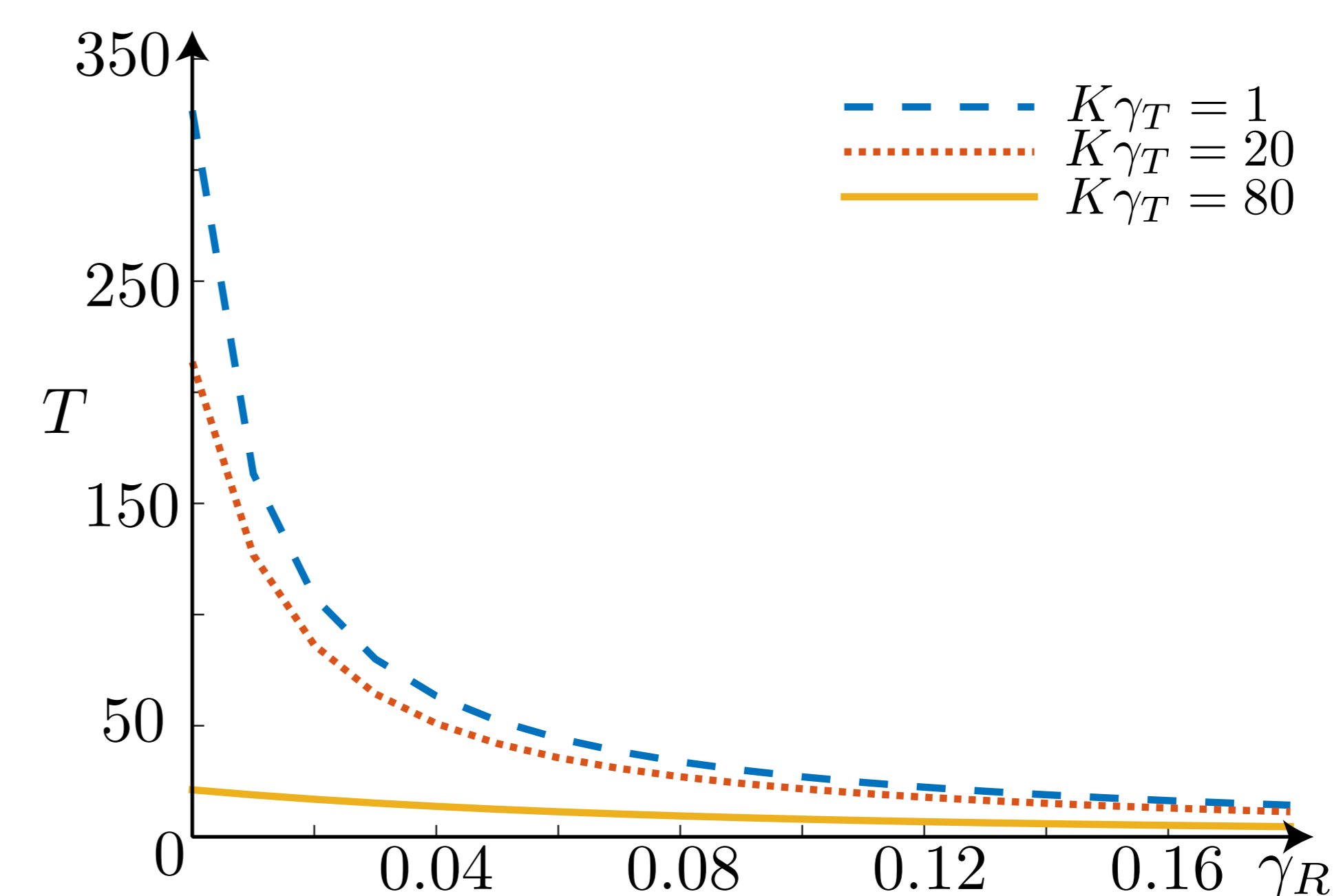
Cache at the Edge

- Tx caching for variable Rx caching
- A lot of Tx caching needs no Rx caching



Cache at the Users

- Tx caching for variable Rx caching
- Even a little Rx caching can do a lot



Take home message

- Tx & Rx caching complement each other
- Adding backhaul can help increase performance

References

- [1] I. Maric, R. Dabora, and A. J. Goldsmith, "Relaying in the presence of interference: Achievable rates, interference forwarding, and outer bounds," *IEEE Transactions on Information Theory*, 2012.
- [2] A. G. Davoodi and S. A. Jafar, "Generalized DoF of the symmetric K-user Interference Channel under finite precision CSIT," in *IEEE International Symposium on Information Theory (ISIT)*, 2016.
- [3] M. A. Maddah-Ali and U. Niesen, "Fundamental limits of caching," *IEEE Transactions on Information Theory*, 2014.
- [4] E. Lampiris, J. Zhang, and P. Elia, "Cache-aided cooperation with no CSIT," in *IEEE International Symposium on Information Theory (ISIT)*, 2017.