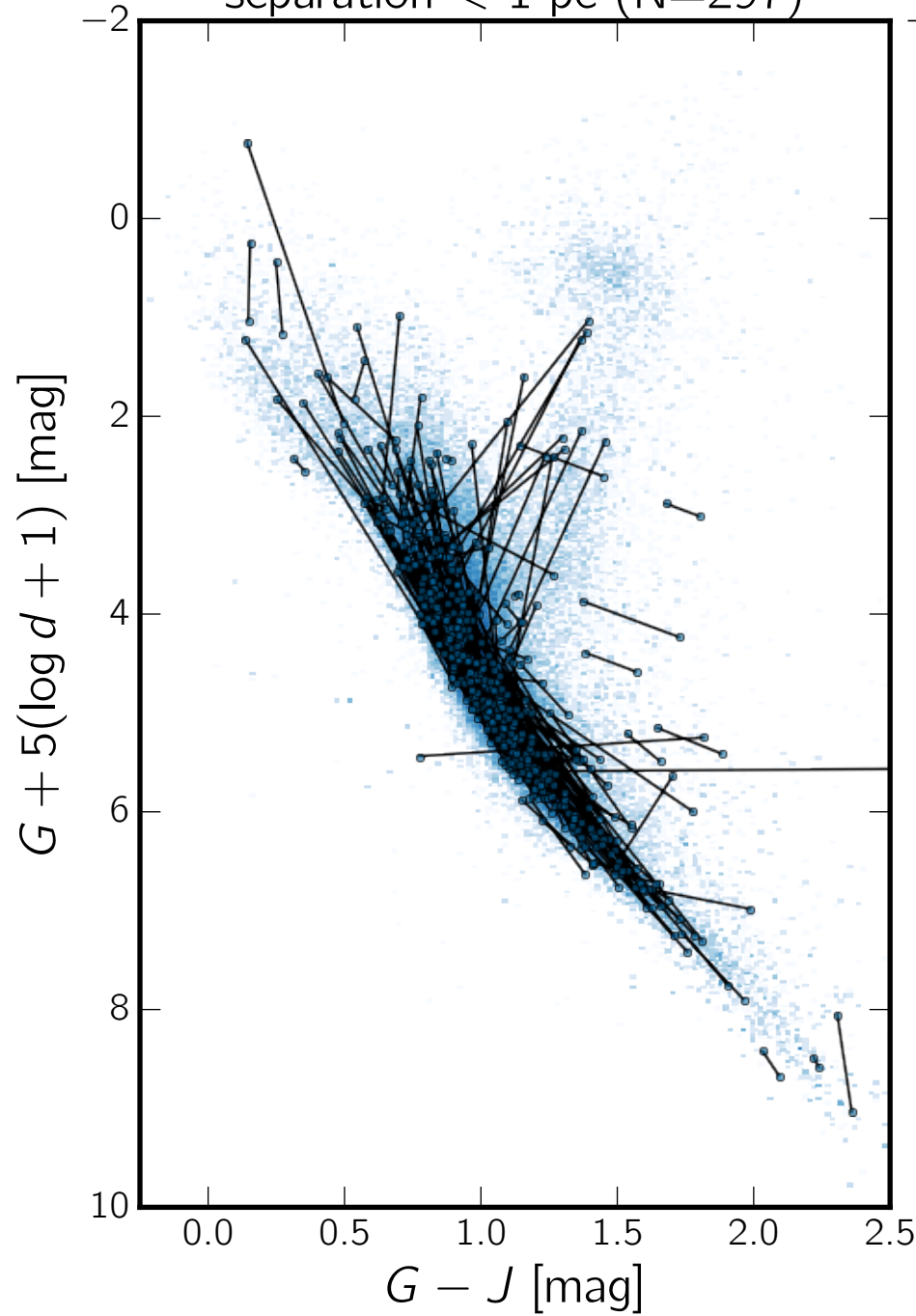mutually exclusive pairs