Lecture 1: Introduction to Fourier Analysis

- p.2, line 16: 'we now at a new' instead of 'we now look at an new'
- p.2, line -1: Maybe \( X \to \mathbb{C}^* \) instead of \( X \to \mathbb{C} \)
- p.3, line 12: An 1 is missing in the denominator, i.e. \(< \chi_j, \chi_k > = \frac{(\omega^{j-k})^n - 1}{\omega^n - 1} \)
- p.3, last line: change the font on \( X \), i.e. \( \chi : X \to \mathbb{T} \)
- p.3, footnote: Maybe, normalize your scalar product (is more consistent with the rest of the script) and write the integral w.r.t. the measure \( \mu \), i.e. \(< f, g > = \frac{1}{|X|} \sum_{x \in X} f(x)g(x) \) and \(< f, g > = \frac{1}{m(X)} \int_X f(x)g(x)d\mu(x) \)
- p.5, Theorem 1.2: clarify "Let \( f : \mathbb{T} \to \mathbb{C} \) a continuous function ... for every \( t \in \mathbb{T} \) at which \( f \) is continuous"
- p.6, Proposition 1.5: correct the denominator, i.e.

\[
\frac{1}{n+1} \left( \frac{\sin \frac{n+1}{2} \pi}{\sin \frac{\pi}{2}} \right)^2
\]

Lecture 2: Introduction to Some Convergence Theorems

- p.8, fejer kernel property 2: normalize \( \frac{1}{2\pi} \cdot \int_{\mathbb{T}} k_n dt = 1 \)
- p.9, normalized measure \( \mu \) ... state that \( \mu(G) = 1 \) explicitly
- p.11, second last line of this proof should be \( \int_a^b |h(x)(P(x) - \bar{h}(x))| dx \leq c \cdot \varepsilon \cdot |b-a| \)
- p.11, end of the proof of Theorem 2.4: You want to say that \( h \equiv 0 \) in \( L^2[a,b] \) and not that \( h = 0 \) pointwise. Right?
- p.11, Theorem 2.5: normalization factor and formulation, i.e.

\[
\lim_{n \to \infty} \frac{1}{n} \sum_{r=1}^{n} f(2\pi r \gamma) = \frac{1}{2\pi} \int_{\mathbb{T}} f(t) dt
\]

Perhaps change also the domain of your function \( f \) appropriate.
- p.12, line 1: It is also used...
- p.12, line -3: 'continuous function \( f \) such that' instead of 'continuous function such that'
• p.13, Definition 2.3: Write for example
\[ \ell_p = \left\{ (x_i)_{i \in \mathbb{N}} : \sum_{i \in \mathbb{N}} |x_i|^p < \infty \right\} \]

• p.13, line -3: third SUM should have a factor 2 in front and secondlast \( e_i \) should be \( e_j \)
\[ 2 \sum < f, e_i > < f - \sum_{j=1}^{n} < f, e_k > e_j, e_i > - 2 \sum_{i} \lambda_i < f - \sum_{j=1}^{n} < f, e_j > e_j, e_i > \]

• p.13, line -2: Replace 'imnter' by 'inner'

**Lecture 3: Harmonic Analysis on the Cube and Parseval’s Identity**

• p.16, line 3 from the bottom: 'Weierstrass' instead of 'Weierstrauss'

• p.17, just before Theorem 3.3: \( f \) should be continuous as well

• p.17, Theorem 3.3: It is not clear where this theorem comes from. I think you stated here the theorem without a proof. Is this Dirichlet’s Theorem?

• Section 3.3: The notation of the 2-Norm is not always the same. It would be clearer if there would always be \( \| \cdot \|_2 \).

• p.20, equation (3.4): maybe more space in between the formulas (around the comma)

• p.20, second line of proof of Theorem 3.11: write \( < f, f > \) instead of \( ||f||_2^2 \)

• p.21, proof of Corollary 3.13 second line: it is not immediately clear from where the factor 2 comes, maybe still sum over \( 1 \leq |r| \leq n \), and change in next line

• p.22, line -5, 'C is a circle', new line for this

**Lecture 4: Applications of the Harmonic Analysis**

• p.24: The way you write Parseval’s Identity is a bit misleading. It is not clear at first view where the normalization factors are. Perhaps you can write these norms and scalarproducts out as sums.
p.24, proof of Corollary 4.2: mention something about the scalar product (real-, complex-valued), because \(< f + g, f + g > = < f, f > + < f, g > + < g, f > + < g, g >\) and in complex case \(< f, g >\) might not be the same as \(< g, f >\).

p.25, line 4, in the integral \(\int g(u) ds\) the term \(e^{-i\mu u}\) is missing and integration should be w.r.t \(u\).

p.25f, Hurwitz proof: I get in most of the calculations the other sign as in the script, e.g. p.25, line -1, should be a \(+'n^2'\) not \(-'n^2'(\ldots\).

p.26, equation (4.2): The second arguments in the scalar products in the first line should be conjugate and analog for the second line.

p.28, MacWilliams identity: factor \(\frac{1}{2^n}\) is missing

p.29, also factors \(\frac{1}{2^n}\) missing in last and third last line of proof

p.30, line 8, matrix dimensions are \(n \times k\) not \(k \times n\)

p.30, line 11, Variable cannot be zero i.e. write 'as for a given \(x \in \{0, 1\}^n, x \neq 0\)'

p.30, second last line of proof: \(|Ax| < \delta\), and in the last exponent there is something strange with the brackets, in the exponent there is still an \(o(n)\) not 1; however than why is \(P_r[..] \leq 2^{negative + o(n)} < 1\)?

p.30, line -1, sum over \(\binom{C}{2}\) rather than \(C \times C\)

p.31, middle, where \(z_i\) is the number of WORDS IN \(C\) WITH zeros in the...

p.32, title of section 4.4: Change the name to 'Erdős'

p.32, line -10, 'intersecting' instead of 'itersecting'

Lecture 5: Isoperimetric Problems

p.34, line 8: 'The edge problem ... \(|S| = k'\) (instead of \(R\)), 'how small \(e(S, S')\) be?'

p. 34: The definition of shadow is strange. I think you want the following

\[ \sigma(f) = \{ y \in 2^{[n]} \mid \exists x \in f : x \supseteq y \} \]

p.36, line 7: 'We need to know \(\hat{1}_{L_j}(T)\) if \(|T| = t.\)

p.36, line 8,9: The factor \(\frac{1}{\pi^2}\) should be on the right hand side.

p.36, line 10: The left hand side should be \(K_j^{(n)}(t)\).
• p.37, line 8: Write $1_{L_p}$ instead of $1_p$ and the same for $q$.

• p.37, line 9, 10: In the Parseval identity you have also a factor $2^n$ which you should add somewhere to get a correct statement.

• p.37, Lemma 5.1: 'The Krawtchouk polynomials satisfies a 3-term recurrence' (the other statement is Theorem 5.2)

Lecture 6: MRRW Bound and Isoperimetric Problems

• p.39, line 2: definition of $f$; factor missing: $f = 2^n \cdot \frac{2^n}{|C|}$

• p.39, line 1, 2 from bottom: Add on the left hand side a factor $2^n$. In line 2 from the bottom the summation should go up to $n$ instead of $r$.

• p.40, proof of fact 6.1: The summation should go up to $n$.

• p.40, line -1, sums from $k = 0$ to $n$, instead of $k = 1$, since there are $n + 1$ constraints

• p.41, line 1: 'Let $\gamma(x) := \sum_{k=0}^{n} \beta_k K_k(x)$.

• p.41, line 3: There should be a $\gamma(0)$ instead of a $\gamma(x)$ on the right hand side.

• p.41, line 9, sum from $k = 0$ and 3 lines later the same

Lecture 7: The Brunn-Minkowski Theorem and Influences of Boolean Variables

• p.50, dictatorship influence: 1 if $1 \in S$ instead of $i \in S$, same next line

• p.51, line 5: The power should be $\frac{n}{n} - 1$.

• p.51, line 8: The fraction should be $\frac{1}{2^n-1}$. And in the big-omega we should write $\log \frac{n}{n}$.

• p.51, line 2 from the bottom: The influence of the $x$ variable in the function $f$ is equal to the number of mixed edges in $x$-direction divided by $2^{n-1}$.

• p.52, line 2, $f(T)$ missing on the right side of the equation

• p.52, last line: The right hand side and the middle term should be divided by $2^n$.

• p.53, line 9: Write $\hat{f}$ instead of $\text{hat}f$.

• p.53, line -2, $\inf_{f}(\emptyset)$ too many brackets
Lecture 8: More on the influence of the variables on boolean function

- p.55, Theorem 8.1: $f : \{-1, 1\}^n \to \ldots$ the $n$ is missing
- p.58, line 2: say that proof starts here
- p.60, line 8: A factor 2 is missing, i.e. for $i \in S$ it holds that $\hat{f}(i)(S) = 2\hat{f}(S)$.
- p.60, middle, ignore the 0 term because $f(\emptyset) = 0$ instead of what is written
- p.60, line 10,17,18,19,20,21: A factor 4 is missing.
- p.62, line 6: Friedgut instead of Freidgut
- p.63, line -5, also Friedgut’s instead of Freidgut’s
- p.70, line -5, again Friedgut

Lecture 9: Threshold Phenomena

(found nothing yet)